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Original Research Article

Impact of Counselling and Health Education on Treatment Adherence and Outcomes in MDR-TB Patients

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ABSTRACT

Background: Multidrug-resistant tuberculosis (MDR-TB) poses a major public health challenge due to prolonged treatment, high pill burden, adverse drug reactions (ADRs), and poor adherence. Non-adherence is strongly associated with unfavourable outcomes, morbidity, and mortality. Counselling and health education are critical interventions to sustain motivation, improve adherence, and enhance treatment outcomes. This study evaluates the role of counselling in MDR-TB management within the Ahmedabad Municipal Corporation (AMC).

Objectives: To assess knowledge and self-care practices related to infection control among MDR-TB patients. To explore patients' perceptions regarding the role of counselling in treatment adherence. To identify challenges encountered by counsellors in delivering effective counselling.

Methodology: A community-based cross-sectional study was conducted from February–October 2021 across five randomly selected TB units under AMC. A total of 115 MDR-TB patients who completed treatment between January–September 2021 were interviewed using a semi-structured proforma. In-depth interviews with five TB counsellors were also conducted. Data were collected through telephonic interviews, home visits, and open-ended discussions.

Results: Of 115 patients, most acknowledged counselling as pivotal in adherence and infection control. Knowledge of self-care practices was limited, with males and less-educated patients scoring significantly lower. Counsellors identified stigma, lack of family support, and ADRs as major challenges. Nonetheless, their role was perceived as essential in sustaining adherence and facilitating treatment completion.

Conclusion: Counselling and health education substantially influence adherence and outcomes in MDR-TB patients. Strengthening patient-centred counselling strategies is crucial to improve treatment success and reduce MDR-TB burden.

Keywords: Ahmedabad, Counselling, Health education, Infection control, MDR-TB, Treatment adherence

INTRODUCTION

"The history of TB shows medicine at its worst and best. For all the bravery and brilliance of some physicians and scientists, there have been many others whose ignorance, incompetence and intransigence have made matters worse—Humanity came off the Magic Mountain, developed the Magic Bullets to kill the Magic Dragon—but ended up slaying itself[1]*"*—
Christopher Holme, *Trial by TB.*

Antitubercular drug resistance (DR) remains a major public health concern and a recognised threat to global health security. In 2017, an estimated 10 million incident cases of tuberculosis (TB) and 1.3 million deaths were reported globally. Of these, 558,000 cases were rifampicin-resistant TB (RR-TB), more than 80% of which were multidrug-resistant TB (MDR-TB)—defined as resistance to both isoniazid (INH) and rifampicin.[2] India, China, and the Russian Federation are global hotspots, with India alone contributing nearly one-quarter of the burden.[3] Despite progress through initiatives such as the *Programmatic Management of Drug-Resistant Tuberculosis* (PMDT), outcomes remain poor, with treatment success rates of only 46% and mortality rates of around 20%. Prolonged treatment duration, pill burden, and frequent adverse reactions to second-line agents compromise adherence, further amplifying resistance.[4-7] Non-adherence has been consistently identified as a major risk factor for unfavourable outcomes, morbidity, and mortality.[8,9]
Social and behavioural determinants, including lack of awareness, weak family support, and inadequate counselling, further contribute to treatment interruption. Counselling and health education, therefore, play a crucial role in sustaining motivation, ensuring adherence, and ultimately improving outcomes. Trained MDR-TB counsellors, by providing information, emotional support, and advocacy, are indispensable in strengthening patient-centred care.
This study is undertaken to explore the role and experiences of counsellors in MDR-TB management, to understand how counselling and health education influence treatment adherence and outcomes in the urban TB units of Ahmedabad Municipal Corporation.

OBJECTIVES

- To assess the knowledge and self-care practices related to infection control among MDR-TB patients.
- To explore patients' perceptions regarding the role of counselling in influencing treatment adherence.
- To identify the challenges encountered by counsellors in delivering effective counselling to MDR-TB patients.

MATERIAL AND METHODS

Study Setting and Area: The study was conducted in the jurisdiction of the Ahmedabad Municipal Corporation (AMC), which is divided into seven zones and 74 wards, with a total population of 6,361,084. [10] The TB control activities in AMC are implemented through the National Tuberculosis Elimination Programme (NTEP). The 74 wards are grouped into 23 Tuberculosis Units (TUs), each managed by a Medical Officer (MO-TU), a Senior TB Treatment Supervisor (STS), and a Senior TB Laboratory Supervisor (STLS). Under each TU, there are 5–6 Designated Microscopy Centres (DMCs), manned by Laboratory Technicians (LTs), and each DMC supervises around eight DOTS centres. In total, 93 DMCs and 115 DOTS centres are functional under the 23 TUs of AMC.[11]

Study Design: A community-based qualitative cross-sectional study was undertaken.

Study Population: The study population included all MDR-TB patients registered under the NTEP who had completed their treatment course between 1 January 2021 and 30 September 2021 in selected TB units of AMC.

Inclusion Criteria:
Patients aged above 18 years.
Patients who provided verbal consent to participate.

Exclusion Criteria:
Patients who migrated to another TB unit during treatment.
Patients who died after diagnosis.
Patients who did not respond telephonically after two calls within 48 hours.

Study Period: The study was conducted from February 2021 to October 2021 (9 months).

Sample Size and Sampling Technique: Out of the 23 TB units in AMC, five TUs were selected by simple random sampling, with one TU selected from each of the five TB counsellor areas. From these units, 115 MDR-TB patients who had completed treatment between January and September 2021 were included

in the study, based on the data provided by the respective TB units.

Study Tool:
A semi-structured proforma was developed, based on NTEP guidelines, and finalised after a pilot study on 24 MDR-TB patients.
The tool collected information on socio-demographic characteristics, knowledge and practices regarding infection control, and the perceived role of counselling in treatment adherence.
The questionnaire comprised two sections: the first part included baseline demographic and clinical information, while the second part included questions assessing knowledge, practices, and counselling experiences.
Both multiple-choice and open-ended questions were included, and knowledge scores were derived from responses related to infection control practices.

Study Procedure: A list of eligible MDR-TB patients was obtained from the Senior TB Treatment Supervisors (STS) and TB Health Visitors (TB HVs) of the five selected TUs. Data collection was carried out from February 2021 to September 2021: Patients who had completed treatment during the study period were interviewed telephonically.
Defaulter MDR-TB patients were contacted through home visits. In-depth interviews were conducted with TB counsellors of AMC. Each interview lasted 20–40 minutes and was conducted after obtaining verbal informed consent.

Ethical Considerations

Approval was obtained from the NHL Institutional Review Board (NHLIRB).

RESULT AND DISCUSSION

A cross-sectional study among 115 MDR-TB patients registered under the Ahmedabad Municipal Corporation (Jan–Sept 2021) interviewed 89 (77.4%) who completed treatment. Of these, 72 (80.9%) had pulmonary and 17 (19.1%) extra-pulmonary MDR-TB, with most (58.5%) aged ≤30 years, highlighting the burden on the productive age group. The mean age was 31.4 ± 13.9 years; females (26.6 ± 12.1) were younger than males (36.3 ± 14.3). Educationally, 38.2% had higher secondary/diploma and 11.2% were illiterate; occupationally, housewives (29.2%) and unemployed (22.5%) predominated, suggesting vulnerability to poor infection-control.

Treatment Adherence and Barriers- Treatment adherence was high (84.8%), with counselling cited as key, especially for longer regimens (68.6%). Barriers included migration, contact change, and substance use. These findings align with earlier rural studies showing >50% of MDR-TB in the productive age group (25) and a UP study reporting two-thirds male cases, mean age 32.1 ± 13.2 (26). Unlike those, our study found more young females <30 affected, indicating gender-specific risk. Overall, systematic counselling and NTEP engagement improved adherence, though socioeconomic barriers and mobility require community support, tailored counselling, and social welfare integration.

Pulmonary vs. Extra-Pulmonary MDR-TB Distribution- Most patients were ≤30 years across both forms. Extra-pulmonary MDR-TB disproportionately affected females (88.3%, n=15), mainly those <30 years (73.4%, n=11), while only two males (11.7%) were affected, in the ≤30 and >51 age groups. No cases occurred in 41–50 years. These findings align with earlier reports of higher extra-pulmonary TB in younger women, attributed to biological and health-seeking factors. Pulmonary MDR-TB showed male predominance (58.3%, n=42 vs. 41.7%, n=30 females). Among males, most were ≤30 years (42.8%, n=18), followed by 31–40 years (26.1%, n=11) and >51 years (21.5%, n=9). Females were mainly ≤30 years (73.3%, n=22), with very few >51 years (3.3%, n=1). Thus, pulmonary MDR-TB affects both sexes but more in men, while extra-pulmonary forms disproportionately affect young females.

Regimen Preferences- The all-oral longer MDR regimen was most common, used in 68.6% (n=61) of cases. Among pulmonary MDR-TB, 66.7% (n=48) received the longer regimen and 33.3% (n=24) the shorter regimen; among extra-pulmonary cases, 76.5% (n=13) received the longer regimen and 23.5% (n=4) the shorter regimen. This preference aligns with NTEP and WHO guidelines, highlighting better tolerability, fewer injectable-related adverse effects, and improved adherence.[5][2]

Perceptions of Treatment Benefits- In this study, most MDR-TB patients (68.6%, n=61) received the all-oral longer regimen—preferred in pulmonary (66.7%, n=48) and extra-pulmonary (76.5%, n=13) cases—while 31.4% (n=28) received the shorter regimen. Regarding treatment benefits, 64.1% (n=57) cited symptom reduction, 27% (n=24) believed it made them non-infectious, and only 1.2% (n=1) were

unaware of benefits, showing overall positive perceptions.

Counselling Duration and Home Visit Frequency- Counselling during home visits lasted 15–30 minutes for most females (30%, n=26) and pulmonary cases (40%, n=35), but <15 minutes for many males (22.5%, n=20) and extra-pulmonary cases, indicating gender- and site-related disparities. Visit frequency was irregular: 38.2% (n=34) reported 6–8 monthly, 36% (n=32) 2–4 monthly, 14.6% (n=13) monthly/bi-monthly, while very few had >8 monthly (5.6%, n=5) or more frequent (1.1%, n=1) visits.

Patient Awareness and Family Counselling- At diagnosis and treatment initiation, 98.8% (n=88) received adequate TB information from health visitors, with only one (1.2%) dissatisfied. All were guided about the treatment course, and 93.3% (n=83) reported family counselling, while 6.7% (n=6) did not.

TB-Related Stigma- Stigma assessment showed 76.4% (n=68) had no hesitation disclosing TB status, but 23.6% (n=21) reported stigma, mainly early in treatment. Extra-pulmonary patients often reported complete stigma removal after counselling, while pulmonary patients noted partial persistence. Stigma was more common in females (15.8%, n=14) than males (7.9%, n=7), and in pulmonary (20.3%, n=18) than extra-pulmonary cases (3.4%, n=3). Educational and occupational factors influenced stigma: patients with primary education (8.9%, n=8) reported more stigma than illiterate or postgraduate patients (4.5%, n=4 each). Housewives (6.7%, n=6) and unemployed (6.7%, n=6) faced more stigma than employed (5.7%, n=5) or students (4.5%, n=4).

Safe Sputum Disposal Practice- Among 72 pulmonary MDR-TB patients, most reported safe sputum disposal—69.4% (n=50) using washrooms/basins and 22.2% (n=16) containers—though unsafe practices persisted, including disposal in dustbins (2.77%, n=2), roads (1.38%, n=1), and other sites (4.16%, n=3).

Substance Use and De-Addiction- Addiction was reported in 29% (n=25) of 86 patients at treatment initiation, with five having multiple habits. Tobacco chewing (12.4%) was most common, followed by smoking (5.7%), pan-masala (4.5%), alcohol (4.5%), and chhikni (1.3%), with all receiving structured counselling and referral to de-addiction centres; 52% (n=13) quit successfully.

Adverse Drug Reactions (ADRs)- Adverse drug reactions (ADRs) were reported by 50% (n=49) of patients most commonly skin darkening/reddening (47.5%) and gastrointestinal disturbances (42.5%), followed by dizziness/vertigo (17.5%), peripheral neuropathy (15%), impaired vision (12.5%), seizures (10%), breathlessness (7.5%), hearing impairment (5%), joint pain (2.5%), and psychosis (2.5%). Among ADR cases (n=49), distribution was almost equal between females and males, with a higher frequency in pulmonary (n=40) than extra-pulmonary (n=9) patients. ADRs were more common in all-oral longer regimens than shorter ones, and tobacco addiction showed a stronger association with ADRs than alcohol or pan-masala.

Table-1: Management of Adverse Drug Reactions: Factors Influencing Adherence in MDR-TB Patients Treatment Challenges (Undermines Adherence)

Adverse Drug Reactions (Side effects such as vomiting, nausea, insomnia, memory loss, brain fog, ophthalmic issues)
Pill Burden (Multiple daily tablets, overwhelming for patients)
Long-Term Commitment (6–12 months emotionally draining)
Restrictions (Lifestyle changes, frustration due to fasting/alcohol restrictions)

Table-2: Treatment Benefits (+/-)

Rapid Health Improvement: Patients feel cured and discontinue treatment prematurely
Not Infectious: Patients stop medicines once they think they are no longer a risk

Table-3: Socio-Economic and Awareness Factors

Promotes Adherence: •Counselling improves awareness • Female patients more aware (15.6% scored ≥4) •Longer counselling sessions (>30 min) improved knowledge •Better awareness in extrapulmonary TB patients • Higher awareness with education (primary and above)

Undermines Adherence:
- Males had poor awareness (100% scored <4)
- Illiterate patients had lowest knowledge
- Shorter counselling sessions
- Poor infection control practices (unsafe sputum disposal)
- Misinterpretation of ADRs as unrelated illness

Among 89 MDR-TB patients, 49 experienced adverse drug reactions (ADRs). Of these, only nine recalled being counselled by DOTS providers, promptly sought care, and had symptoms satisfactorily managed, while 10 lacked such counselling, misinterpreted symptoms as unrelated illnesses, and reported fear until clarified during home visits. Management strategies included symptomatic treatment (32.5%), specific therapy (32.5%), dosage reduction (22.5%), and regimen modification (15%). Prior studies support these findings: Gupta et al. identified ADRs as a major cause of treatment discontinuation, mitigated through early counselling and timely intervention. [(12)] While Rupani et al. reported regimen modification in 13.8% of MDR-TB patients due to ADRs, underscoring their role in treatment default. [(13)] Most ADRs are mild and manageable, but some necessitate withdrawal of the offending drug, highlighting the importance of vigilant monitoring and early counselling.

Self-care awareness regarding adherence, sputum disposal, and cough etiquette was notably poor, with 92.1% scoring <4 and only 7.9% achieving ≥4. Gender showed a significant association: all males scored <4, while 15.6% of females demonstrated better awareness (p=0.0121). Educational status showed a positive but non-significant trend, with illiterate patients performing worst and graduates showing modest improvement. Extra-pulmonary TB patients (17.6%) demonstrated relatively higher awareness than pulmonary cases (5.6%), though not significantly. Longer counselling sessions (>30 minutes) were associated with improved awareness (25% vs. 6.2%), but without statistical significance. Similar findings were reported in Ethiopia and Nigeria, where gender and education significantly influenced TB-related knowledge and practices.[(14)(15)] Collectively, these results highlight the need for strengthened counselling and targeted health education, particularly for men and less-educated groups, to improve adherence, infection control, and treatment outcomes.

IN-DEPTH INTERVIEW OF TB COUNSELLOR:

In the current study, efforts were made to know counsellors' perspectives regarding the impact of counselling on treatment adherence in MDR TB patients. There are 5 counsellors appointed for 23 TB units in the Ahmedabad Municipal Corporation. All the counsellors had 5 years of experience, as they were appointed in July 2016. Each counsellor was interviewed personally with open-ended questions.

1. **Question: How much time do you give to regular patients and defaulter, and how frequently do you visit them?**

Answer: Counsellors reported spending 15–20 minutes with regular patients, except one who provided 30–45 minutes; for defaulters, counselling time was extended by 15–30 minutes. Patient follow-up was prioritized: first-priority cases (intensive phase, treatment interruptions, comorbidities, ADR, or family issues) were visited monthly; second-priority cases (stable, culture-negative, no ADR or family issues) twice quarterly; and third-priority cases (in continuous phase nearing completion, good adherence, no ADR) once quarterly. Patients requiring social linkages (Aadhar/MAA card, income/death certificates, domestic support) were visited fortnightly, with home visits conducted as per need. During the COVID-19 pandemic, counselling was adapted to include video calls for patients who were unwilling to accept home visits.

2. Question: Which aspects of patient care and which groups of patients require more counselling?

Answer: Counsellors emphasized that patients with adverse drug reactions and substance abuse (alcohol and tobacco) required the most intensive counselling, followed by guidance on nutrition (including diet charts) and cough etiquette, with additional focus on psychosocial issues such as TB-related stigma, depression, occupational concerns, and family problems. In terms of patient groups, alcoholic patients were consistently identified as needing the most counselling, while migrants and labourers also required more attention. Illiterate or uneducated patients and those with uncontrolled diabetes were highlighted as priority groups, and one female counsellor specifically attended female Muslim patients across all TUs due to "parda-pratha" restrictions.

3. Question: As per your opinion, how much TB-related stigma has been reduced among patients due to counselling?

Answer: Three counsellors reported that counselling reduced TB stigma by about 70%, one estimated a 50% reduction, while another observed only a 20–30% reduction.

4. Question: What is the role of counselling in compliance with the drug regimen?

Answer: One counsellor reported 90% adherence to treatment following counselling, while others estimated 70%, 60%, and 40%, with one unsure. Regarding treatment interruption, three counsellors believed counselling reduced defaulters by 40–60%, while others estimated only a 20–30% reduction.

Reason for Default: All counsellors identified substance abuse (alcohol) as the most common cause of default. Three counsellors highlighted migration as the second major factor, followed by adverse drug reactions. Additional reasons cited included domestic conflicts, patient transfer, and Mental Retardation.

5. Question: What additional efforts have you taken in your area?

Answer: All counsellors reported establishing social linkages with NGOs to provide free nutrition kits for poor patients, while three also facilitated job placements and school admissions. They linked substance-abuse patients with de-addiction centers and assisted patients in obtaining Aadhar and MAA cards. One counsellor involved traditional healers, fellow counsellors, and program health officers for non-cooperative patients, while another organized motivational meetings with successfully treated patients to encourage those on treatment. In transfer-out cases, counsellors coordinated closely with TB health visitors, STS, and STLS to ensure adherence. Additionally, one counsellor reported NGO support in distributing free masks and sanitizers during the COVID-19 pandemic.

6. Question: Due to the COVID-19 pandemic, which challenges did you face?

Answer: Counsellors reported that many patients avoided visiting DOTS centers and DR-TB sites (Asarwa Civil Hospital and Sola Civil Hospital) for medicine collection, investigations, and follow-ups due to fear of COVID-19 infection. Some patients expired because of delayed TB diagnosis and TB–COVID co-infection. While counsellors provided medicines at patients' homes, certain patients even refused home visits. One counsellor highlighted difficulties in delivering DOTS to migrants during lockdown, and another noted that Muslim patients in Vejalpur TU often resisted mask use despite repeated counselling.

7. Question: Due to the COVID-19 pandemic, which factors turned out to be favourable for your work?

Answer: Counsellors unanimously noted that the pandemic encouraged patients to adopt preventive practices such as mask-wearing and proper cough etiquette, which also contributed to a decline in new TB cases. Moreover, improved self-care among patients led to more regular visits to DOTS centers for medicine collection.

8. Question: In your total years of counselling service, what changes have you observed in self-care, treatment compliance, family support, and acceptance of TB among patients and their families, and what are the reasons?

Answer: Counsellors reported a marked improvement across all domains. **Self-care** increased from 50% to 70%, driven by enhanced awareness through education, technology use, counselling, role-model speeches, and social linkages. **Treatment compliance** rose from 70% to 90%, attributed to greater TB awareness (IEC activities, posters, hoardings, TV advertisements), active case finding through family screening, and the availability of new standard drugs. **Family support** improved from 70% to 90% due to targeted counselling of caregivers, reduced stigma among the younger generation, and greater emphasis on nutrition and timely medication. **Acceptance of TB** among patients and families increased from 70% to 95%, facilitated by government-led awareness, education, and counselling efforts; notably, one patient remarked, *"Since Amitabh Bachchan did the advertisement, there is no need to fear.(* "*Amitabh Bachchan ae advertisement kari chhe, to darvani jarur nthi)"*

CONCLUSIONS

This cross-sectional study among MDR-TB patients under Ahmedabad Municipal Corporation highlights that systematic counselling is a cornerstone of treatment adherence, stigma reduction, and patient empowerment. The findings show that MDR-TB

disproportionately affects individuals in the productive age group, with pulmonary TB more common in men and extra-pulmonary forms predominating in young women. Counselling improved treatment compliance, self-care, family support, and acceptance of TB, with clear benefits observed in reduced stigma and better linkage to social welfare schemes. However, barriers such as migration, substance abuse, adverse drug reactions, and socioeconomic vulnerabilities remain significant challenges. Adverse drug reactions were reported in half of the patients, yet timely counselling and management prevented treatment discontinuation in most cases. Despite progress, self-care awareness was poor, particularly among men and the less-educated, underscoring gaps in health education and behaviour change. The COVID-19 pandemic posed disruptions but indirectly promoted favourable practices like mask use and cough etiquette, further contributing to TB prevention.

RECOMMENDATIONS:

1. **Strengthen Patient-Centred Counselling:** Tailored counselling should target high-risk groups—alcohol/tobacco users, migrants, illiterate patients, and young females with extra-pulmonary TB—to address specific barriers to adherence.

2. **Enhance ADR Management:** Early identification, counselling, and timely clinical management of ADRs must be integrated into routine care to prevent treatment default.

3. **Improve Self-Care Awareness:** Structured health education focusing on infection control, cough etiquette, and safe sputum disposal is needed, particularly for men and those with lower education.

4. **Promote Family and Community Support:** Continued counselling of caregivers and engagement with community/NGO linkages should be prioritized to reduce stigma and provide nutritional and social welfare support.

5. **Leverage Technology and IEC:** Mobile-based counselling, video calls, and widespread IEC campaigns (posters, media, role-models) should be scaled up to improve reach and consistency.

6. **Policy Integration:** Strengthen intersectoral coordination under NTEP to address socioeconomic determinants—migration, unemployment, and addiction—through welfare schemes, job linkages, and de-addiction services.

REFERENCES

1. Udwadia ZF. Totally drug-resistant tuberculosis in India: Who let the djinn out? Respirology [Internet]. 2012 Jul;17(5):741–2.

2. Global Tuberculosis Report 2021. 1st ed. Geneva: World Health Organization; 2021.

3. Nguyen HB, Nguyen CV, Tran HTG, Nguyen HV, Bui QTT. Prevalence of resistance to second-line tuberculosis drug among multidrug-resistant tuberculosis patients in Viet Nam, 2011. WPSAR [Internet]. 2016 Jul 1;7(2):35–40.

4. Ramachandran R, Nalini S, Chandrasekar V, Dave PV, Sanghvi AS, Wares F, et al. Surveillance of drug-resistant tuberculosis in the state of Gujarat, India. Int J Tuberc Lung Dis. 2009 Sep;13(9):1154–60.

5. World Health Organization. Implementing the end TB strategy: the essentials [Internet]. Geneva: World Health Organization; 2015. 113 p.

6. Guidelines for PMDT in India.pdf

7. Gugssa Boru C, Shimels T, Bilal AI. Factors contributing to non-adherence with treatment among TB patients in Sodo Woreda, Gurage Zone, Southern Ethiopia: A qualitative study. J Infect Public Health. 2017;10(5):527–33.

8. Poor adherence to medication is widely known as a causal factor for increased risk of morbidity, mortality and cost burden 2021 Dec 20.

9. Johnston JC, Shahidi NC, Sadatsafavi M, Fitzgerald JM. Treatment Outcomes of Multidrug-Resistant Tuberculosis: A Systematic Review and Meta-Analysis. Pai M, editor. PLoS ONE; 2009 Sep 9;4(9):e6914.

10. Ahmedabad City Population Census 2011-2021 Gujarat.

11. RNTCP, Ahmedabad Municipal Cprporation Data.

12. Gupta A, Kumar V, Natarajan S, Singla R. Adverse drug reactions & drug interactions in MDR-TB patients. Indian Journal of Tuberculosis; 2020 Dec;67(4):S69–78.

13. Rupani M, Dave J, Parmar V, Singh M, Parikh K. Adverse drug reactions and risk factors for discontinuation of multidrug-resistant tuberculosis regimens in Gujarat, western India. Natl Med J India [Internet]. 2020;33(1):10.

14. Kusheno FT, Nguse TM, Gebretekle GB. Assessment of Knowledge and Attitude of Tuberculosis Patients in Direct Observation Therapy Program towards Multidrug-Resistant Tuberculosis in Addis Ababa, Ethiopia: A Cross-Sectional Study. Tuberculosis Research and Treatment. 2020 Jun 8 ;2020:1–10.

15. Isara A, Akpodiete A. Concerns about the knowledge and attitude of multidrug-resistant tuberculosis among health care workers and patients in Delta State, Nigeria. Niger J Clin Pract. 2015;18(5):664.

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