

# Implementation fidelity of direct observation treatment and short-term treatment for tuberculosis in public health centers in the Kembata Tembaro Zone, Southern Nations Nationalities and People Region, Ethiopia

Awoke Masrie<sup>1\*</sup>, Tewodros Lemma Gorfu<sup>2</sup>, Yisalemush Assefa<sup>3</sup>, Samrawit Shawel<sup>1</sup>, Aklilu Tamire<sup>1</sup>, Tilaye Gebru<sup>4</sup>, Daniel Amsalu<sup>5</sup>, Berhane Megerssa Ereso<sup>3</sup>

<sup>1</sup>School of Public Health, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia.

<sup>2</sup>Organization for Social Services Health and Development (OSSHD).

<sup>3</sup>Department of Health Policy and Management, Public Health Faculty, Institute of Health Jimma University, Ethiopia.

<sup>4</sup>School of Nursing and Midwifery, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia.

<sup>5</sup>Center for Disease Control and Prevention, Jimma, Ethiopia.

\*Corresponding author: Awoke Masrie.

## Abstract

**Introduction:** Ethiopia is one of 30 countries with a high tuberculosis (TB) burden, with an incidence of 140 per 100,000 people. The Kembata Tembaro Zone (KTZ) had lower TB case notification and treatment success rates (60% and 82%, respectively) in 2019 than did the National and World Health Organization (WHO) targets. The aim of the present study was to evaluate the implementation fidelity of short-term direct observation treatment for tuberculosis.

**Methods:** A case study evaluation design with a mixed method was employed from May 10 to June 4, 2021. A total of 91 patients were interviewed. Similarly, a document review of 384 patients, 16 key informant interviews, and a resource inventory were conducted. The quantitative data were entered into Epi-Data (V4.0.64) and exported to the Statistical Package for the Social Sciences version 26 (SPSS 26) for analysis. The qualitative data were transcribed, translated, coded, categorized, and analyzed using thematic analysis. The overall implementation fidelity was measured based on predetermined criteria.

**Results:** The overall level of TB direct observed treatment short-course (DOTS) implementation fidelity was 73.9%, and the overall availability of resources was 81%, the provider's adherence to the national guidelines was 73.1%, the quality of TB DOTS delivery was 75.9%, and the participant responsiveness contributed 63.9%.

**Conclusion:** The overall level of implementation fidelity of TB DOTS services in public health centers was low based on the predetermined set of judgment criteria. Training should be provided to providers, acid-fast bacillus (AFB) reagents should be supplied, standard updated guidelines should be made available, and providers should strictly comply with the standard guidelines. There should also be a full-time assigned TB DOTS provider in the TB units.

**Keywords:** implementation fidelity; tuberculosis; directly observed treatment short course; kembata tembaro zone

## Introduction

Mycobacterium tuberculosis (MTB), which is the causative agent of the disease TB, may kill more people than any other microbial pathogen. TB is an infectious disease that is a significant contributor to poor health and a leading cause of death worldwide. Prior to the COVID-19 pandemic, TB was the primary cause of death caused by a single infectious agent, surpassing even HIV/AIDS (1,2). Globally, approximately 10.6 million individuals were predicted to contract TB in 2021, representing a 4.5% increase from the previous year's count of 10.1 million (1). The incidence rate of TB increased by 3.6% from 2020 to 2021. There are 30 high-TB burden countries

that account for 87% of the global TB burden, and 8 countries (India, Indonesia, China, Philippines, Pakistan, Nigeria, Bangladesh and South Africa) constitute 2/3<sup>rd</sup> of the total global burden. According to a 2022 global TB report, 23% of the world's TB incidence was detected (1,3). Ethiopia is one of the 30 countries with a high TB burden, with annual case detection and treatment success rates of 69% (140 per 100,000 people) and 95%, respectively. Approximately 0.7% of the new TB patients and 12% of the previously treated TB patients had multidrug-resistant tuberculosis (MDR-TB) (4). As part of the world, Ethiopia began to control TB in the early 1960s, and DOTS were implemented in four pilot

areas of the country in 1997(2,5). DOTS is an approach used to treat TB patients in a way that is sensitive and supportive of the patient's needs. The aim of treatment is to cure patients with TB, prevent death from TB disease and its late effects, prevent relapse, prevent the development of acquired drug resistance, and decrease transmission (5,6). All TB-diagnosed patients are recommended to take their anti-TB medications under the direct observation of a treatment supporter. Adequate availability of anti-TB drugs, laboratory reagents, medical supplies and equipment is needed for successful implementation of DOTS (6). A study conducted in health facilities in southern Ethiopia revealed that the availability and accessibility of DOTS are determinants of the implementation of the service in a quarter of TB patients (7). Previous studies on the implementation status of DOTS in different parts of Ethiopia showed that services provided by professionals who did not receive adequate training, incorrect prescriptions of anti-TB drugs and doses, improper sputum follow-up examinations and poor patient-provider interactions were the major problems (8-10). The annual case detection rate and treatment success rate in the study area in 2020 were 60% and 82%, respectively, which are lower than the country achievement rates (69% case detection and 95% treatment success rate) (11). Even if the DOTs were implemented in all public health centers in the study area beginning in 1997, to the best of our knowledge, no evaluation has been conducted on the implementation status and fidelity of DOTs. Therefore, this study was conducted to provide a complete picture of the implementation of DOT services. The study assessed the availability of the needed resources, treatment adherence, quality of TB treatment delivery from the patient perspective and patient responsiveness toward DOTS given in the health centers found in the Kembata Tembaro Zone, Southern Nations Nationalities and People Region, Ethiopia.

## Materials and methods

### Evaluation Design and Setting

A facility-based multiple case study design with a mixed method was used, and both qualitative and quantitative data were collected concurrently to evaluate the fidelity of directly observed treatment for short-term tuberculosis in the Kembata Tembaro Zone, Southern Nations, Nationalities and People's region. The evaluation was conducted from May 10 to

June 9, 2021. The patients in this study were from public health centers in the Kembata Tembaro Zone. The zone has a total of 962,815 people, of which 484,296 are females. There are 10 administrative districts, and the zone has one general hospital, 4 primary hospitals, 33 governmental and 3 nongovernmental health centers and a total of 138 health posts.

### Variables and Measurements

A formative evaluation approach was used to evaluate the implementation fidelity of directly observed TB treatment. Adherence was assessed using 12 sets of indicators to determine whether TB DOT providers adhere to the national TB treatment guidelines. The quality of delivery was assessed using 18 sets of indicators indicating whether the TB DOT service given to patients attained some expected level of quality. Resource availability was measured using 88 sets of indicators to determine whether the required essential drugs and medical supplies were supplied in the health facilities. Participant responsiveness was assessed by measuring the level of patient satisfaction with the TB DOT service using 8 items, each containing a five-point Likert scale (1=very dissatisfied, 2=dissatisfied, 3=neutral, 4=satisfied and 5=very satisfied). Overall participant responsiveness was measured by the mean score given by patients on their level of satisfaction. This score was calculated with SPSS, and the average values were calculated to standardize and compare the present evaluation findings with those of other studies. Intervention complexity and facilitation strategies were measured qualitatively by interviewing the study participants. The indicators were given weights by the stakeholders before the evaluation, and indicator scores were calculated by using the following formula (indicator score=): The judgment parameter was determined based on the calculated indicator score and set as high  $\geq 85\%$ , medium 75%-84.9%, low 60%-74.9% and poor  $\leq 59.9\%$ . The weights of the indicators and dimensions were set as 25% for availability, 35% for adherence, 20% for quality of TB DOTS delivery and 20% for participant responsiveness.

### Sample size and sampling procedures

For the quantitative study, all medical records of TB patients who were receiving treatment during the evaluation period and an additional year (July 2019 to June 2020) were reviewed. Moreover, all TB patients who came to the health center for DOT were interviewed, and eight public health centers were

assessed for the availability of the required resources for the service. For the qualitative study, seven TB DOTS providers, six heads of public health centers and four district TB foci were interviewed. Among the 10 administrative districts (7 woredas and 3 town administrations), 50% were selected by a simple random sampling technique. Then, 50% of the health centers found in the selected administrative districts were randomly selected for inclusion in the study (12). Accordingly, 8 public health centers from the administrative districts were selected.

### Data collection tool and procedures

The tools used to collect the data were developed by referring to different studies, global and national tuberculosis treatment guidelines and recommendations (5,13–15). The tool consists of a structured questionnaire for patient exit interviews, a data extraction tool for document review (Table S1), a checklist for resource inventory (Table S2) and a semistructured in-depth interview guide for key informant interviews. All tools were developed in English, translated to Amharic, and translated back to English for consistency. Validity and reliability: The validity of the data collection tool was measured by taking 5% of the sample from a health center that was not sampled in the study. The internal consistency of the results was measured across variables within the questionnaire with Cornbrash's alpha. Accordingly, the measurement tool alpha level is in the recommended range (0.74). Four BSc nurses and two health officers were employed for data collection and supervision, respectively. Training was given prior to data collection by the principal evaluator for both the data collectors and the supervisors for two days.

### Data Management and Analysis

The quantitative data were checked for completeness, edited, coded and entered into Epi data (version 4.6), which were subsequently exported to SPSS version 26 for analysis. Univariate analysis (including means, standard deviations, frequencies and percentages) was done, and the results are presented in the tables and text. Qualitative data were transcribed first and then translated and coded. The codes were categorized into different categories and then thematized. Finally, the qualitative data were presented in narrative form to complement the quantitative findings. The evaluation findings were interpreted based on a predetermined judgment matrix. Additionally, the performance of each patient (from public health centers) was analyzed based on the collected data and is displayed in tables and narrates.

### Results

We reviewed the records of 384 TB patients from the TB unit register. Among these patients, 170 had smear-positive pulmonary TB, and we checked whether sputum follow-up tests were performed at the end of the 2nd, 5th and 6th months of treatment follow-up. Among the 384 total TB patients, 89.6% were in the continuation phase of anti-TB treatment. More than half (51.8%) of the patients were aged 25 to 49 years, and 53.4% of them were males. The majority (66.9%) of the TB patients were pulmonary TB patients, and 97.4% were newly diagnosed patients (Table 1).

**Table 1:** Characteristics of TB patients recorded in the unit TB registry of Kembata Tembaro Zone Health Centers, SNNPR, Ethiopia, 2021

| Characteristics  |                         | Frequency | Percentage |
|------------------|-------------------------|-----------|------------|
| Age              | 15-24                   | 128       | 33.3       |
|                  | 25-49                   | 185       | 51.8       |
|                  | >=50                    | 57        | 14.8       |
| Sex              | Male                    | 205       | 53.6       |
|                  | Female                  | 179       | 46.4       |
| TB type          | Pulmonary               | 257       | 66.9       |
|                  | Extra pulmonary         | 127       | 33.3       |
| Patient category | New                     | 374       | 97.4       |
|                  | Relapse                 | 9         | 2.3        |
|                  | Treatment after failure | 1         | 0.3        |

### Adherence Content

Among the 384 TB patients, 99.7% received the correct anti-TB drug regimen, and 96.3% received the

correct dose during the intensive phase of treatment. However, during the continuation phase, 87.2% and 82.8% of the 344 TB patients received the correct drug regimen and dose, respectively. Nutritional assessment was performed for 67.7% of the TB patients, and an HIV test was offered for 91.7% of them (Table 2). Most TB DOTS providers mentioned that full-time assigned DOTS providers were unavailable in the TB treatment unit.

### One participant explained

“All health care workers, whether trained or not, provide services in the TB unit. Therefore, most of the time, professionals forget to measure the weight of the patient, and even if they measure it, they fail to record on unit TB register” (a 26-year-old male DOT provider).

### Other study participants added

“Even if the weight scale is not functional, I measure my patient’s weight in the medical OPD rooms. However, when other professionals deliver the service, they use the intensive phase measured weight” (a 25-year-old male TB DOTS provider). Some of the key informants stated that nutritional assessment involves measuring the patient’s weight.

### One participant expressed

“I think that assessing the nutritional status of TB patients is measuring their weight during treatment initiation and at the end of the 2<sup>nd</sup> month” (a 35-year-old female DOTS provider). The other study participants stated that the unavailability of height measuring tape was the reason why they did not assess their patients’ nutritional status.

### One participant clarified this issue

“Of course, nutritional assessment means calculating the patient’s body mass index (BMI) by measuring their weight and height, but I have no height

measuring tape here in the TB room” (a 36-year-old male DOTS provider). Of the individuals who were identified as having smear-positive pulmonary TB, 79% had follow-up sputum examinations at the second month, 64.7% at the fifth month, and 66.9% at the sixth month of treatment (Table 2). Failure to request regular sputum follow-up examination was observed in all of the health centers.

### One participant explained

“Even if I have ordered a sputum follow-up request, the request paper frequently returns back without results, and when I communicate with the laboratory professionals, they said there is no acid alcohol” (a 36-year-old male DOTS provider). Among the 190 smear-positive pulmonary TB patients, drug susceptibility testing was performed for only 20.5% (Table 2). Some TB DOTS providers mentioned that they do not know whether they have to use smear-positive TB patient samples for drug susceptibility testing.

### A participant elaborated on this issue:

“I have been trained on comprehensive TB care 3 years ago but no refreshment training after that, and I have no idea about what drug sensitivity test is and where to send a sample” (a 35-year-old female DOTS Provider).

### Frequency

All 91 patients who were receiving treatment were treated with anti-TB drugs daily without interruptions.

### Duration

Among the 91 TB patients, 5 (5.5%), 77 (84.6%) and 9 (9.9%) took their daily DOTS in front of a health care provider for the first two weeks, for the intensive phase only and for both the intensive and continuation phases, respectively (Table 2).

**Table 2:** Level of TB DOTS providers adherence among public health centers in Kembata Tembaro Zone, SNNPR, Ethiopia, 2021

| Indicator                                                                                                                                         | Angecha<br>(n, %) | Funemura<br>(n, %) | Damboya<br>(n, %) | Teza<br>(n, %) | Doyogena<br>(n, %) | Durame<br>(n, %) | Hadero<br>(n, %) | Mare<br>(n, %)   |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------|-------------------|----------------|--------------------|------------------|------------------|------------------|
| Proportion of TB patient who had received standard anti TB treatment regimen during IP                                                            | 38(100)           | 31(96.8)           | 49(100)           | 55(100)        | 48(100)            | 27(100)          | 89(100)          | 46(100)          |
| Proportion of TB patient who had received correct TB drug dose during IP                                                                          | 34(89.4)          | 31(96.8)           | 46(93.8)          | 54(98.1)       | 47(97.9)           | 27(100)          | 86(93.6)         | 45(97.8)         |
| Proportion of smear positive pulmonary TB patient for whom sputum follow up examination was done at the end of 2 <sup>nd</sup> month of treatment | 13(92.8)          | 6(42.8)            | 18(78.2)          | 55(100)        | 7(38.8)            | 6(75)            | 35(81.3)         | 24(96)           |
| Proportion of smear positive pulmonary TB patient for whom sputum follow up examination was done at the end of 5 <sup>th</sup> month of treatment | 11(78.5)          | 1(9)               | 17(85)            | 23(88.4)       | 3(20)              | 6(75)            | 14(41.1)         | 22(88)           |
| Proportion of smear positive pulmonary TB patient for whom sputum follow up examination was done at the end of 6 <sup>th</sup> month of treatment | 11(84.6)          | 1(9)               | 17(85)            | 55(100)        | 1(6.6)             | 6(75)            | 15(48.3)         | 24(96)           |
| Proportion of TB patient whose BMI is calculated during treatment initiation                                                                      | 11(9.2)           | 6(18.7)            | 15(30.6)          | 55(100)        | 30(62.5)           | 21(77.7)         | 76(85.3)         | 46(100)          |
| Proportion of TB patients who were screened for HIV                                                                                               | 37(97.3)          | 25(78.1)           | 45(91.8)          | 52(94.5)       | 33(68.7)           | 26(77.7)         | 88(98.8)         | 46(100)          |
| Proportion of pulmonary TB patient for whom drug susceptibility test was performed                                                                | 0(0)              | 0(0)               | 0(0)              | 1(3.4)         | 0(0)               | 2(20)            | 22(45.8)         | 15(93.3)         |
| Proportion of TB patients whose weight was measured at the end of IP                                                                              | 28(82.3)          | 12(50)             | 31(75.6)          | 47(97.9)       | 34(70.8)           | 20(86.9)         | 71(91)           | 44(95.6)         |
| Proportion of TB patient who had received standard anti TB treatment regimen during the continuation phase                                        | 32(91.4)          | 13(54.1)           | 34(82.9)          | 55(100)        | 37(82.2)           | 21(91.3)         | 70(85.3)         | 45(97.8)         |
| Proportion of TB patient who had received correct dose during the continuation phase                                                              | 29(82.8)          | 12(50)             | 32(78)            | 45(93.7)       | 33(77.7)           | 21(91.3)         | 70(85.3)         | 43(95.5)         |
| Proportion of TB patients who had received their dot for the intensive and continuation phase                                                     | 0(0)              | 0(0)               | 0(0)              | 6(85.7)        | 0(0)               | 0(0)             | 0(0)             | 0(0)             |
| Overall level of adherence                                                                                                                        | 62.17<br>(low)    | 38.8<br>(poor)     | 61.6<br>(low)     | 75<br>(medium) | 48<br>(poor)       | 66.9<br>(low)    | 65.8<br>(low)    | 81.5<br>(medium) |

(Judgment  $\geq 85$ , high level; 75-84.9, medium 60-74.9, low  $\leq 59.9$ , poor)

Most DOT providers agree that appointing patients to come daily for drug collection was very difficult since the patients have to pay every day for transportation and because the drugs also tire patients.

**One DOTS provider stated:** “It is very exhausting for the patients to come daily for collecting drugs;

therefore, I will give them daily for the first two weeks, and then I will see their progress and appoint them to come every week by giving them a 1-week drug” (a 25-year-old male DOTS Provider). The overall level of adherence of health care providers to the national TB treatment guidelines was 73.11%, which is in the low-level range according to the predetermined judgment criteria (Table 3).

**Table 3:** Judgment matrix for the adherence subdimension in the evaluation of TB DOTS in public health centers in the Kembata Tembaro Zone, SNNPR, Ethiopia, 2021

| Indicators                                                                                                                                             | E    | O   | W | S    | A    | JP                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|---|------|------|---------------------------------------------------------------------------------------------------------------------------------------|
| The proportion of TB patients who had received standard anti- TB treatment regimen during intensive phase                                              | 384  | 383 | 4 | 3.99 | 99.7 | >=85 High level of adherence<br>75-84.9 Medium Level of Adherence<br>60-74.9 Low Level of Adherence<br><=59.9 Poor Level of Adherence |
| The proportion of TB patients who had received the correct TB drug dose during intensive phase                                                         | 384  | 370 | 4 | 3.85 | 96.4 |                                                                                                                                       |
| The proportion of smear-positive pulmonary TB patients for whom sputum follow-up examination was done at the end of 2 <sup>nd</sup> month of treatment | 172  | 136 | 2 | 1.58 | 79.1 |                                                                                                                                       |
| The proportion of smear-positive pulmonary TB patients for whom sputum follow-up examination was done at the end of 5 <sup>th</sup> month of treatment | 150  | 97  | 2 | 1.29 | 64.7 |                                                                                                                                       |
| The proportion of smear positive pulmonary TB patients for whom sputum follow-up examination was done at the end of 6 <sup>th</sup> month of treatment | 145  | 97  | 2 | 1.34 | 66.9 |                                                                                                                                       |
| Proportion of TB patients whose BMI is calculated during treatment initiation                                                                          | 384  | 260 | 2 | 1.35 | 67.7 |                                                                                                                                       |
| The proportion of TB patients who were screened for HIV                                                                                                | 384  | 352 | 2 | 1.83 | 91.7 |                                                                                                                                       |
| Proportion of pulmonary TB patient for whom drug susceptibility test was performed                                                                     | 191  | 40  | 2 | 0.42 | 20.9 |                                                                                                                                       |
| Proportion of TB patients whose weight was measured at the end of intensive phase                                                                      | 344  | 287 | 2 | 1.67 | 83.4 |                                                                                                                                       |
| Proportion of TB patient who had received standard anti TB treatment regimen during the continuation phase                                             | 344  | 300 | 4 | 3.49 | 87.2 |                                                                                                                                       |
| Proportion of TB patient who had received correct dose during the continuation phase                                                                   | 344  | 285 | 4 | 3.31 | 82.8 |                                                                                                                                       |
| Proportion of TB patients who had received their dot on daily basis                                                                                    | 91   | 91  | 2 | 2    | 100  |                                                                                                                                       |
| The proportion of TB patients who had received their dot for the intensive and continuation phase                                                      | 60   | 6   | 3 | 0.3  | 10   |                                                                                                                                       |
| Overall level of adherence                                                                                                                             | 73.1 |     |   |      |      | Low                                                                                                                                   |

## Moderating factors

### Sociodemographic characteristics of the respondents

A total of 91 TB patients were interviewed to assess the quality of TB DOTS delivery and the responsiveness of TB patients toward the DOTS delivered in the health centers. Of the 91 respondents, 51.6% were males. The mean age of the

respondents was 33.75 (SD=15.9) years, and 37.4% of the respondents were aged 15 to 24 years. The majority (81.3%) of the respondents were Protestants. Most (70.3%) of the respondents were from rural areas, and 37.4% of them could not read or write. Forty-four percent of the respondents were farmers by profession (Table 4).

**Table 4:** Sociodemographic characteristics of TB patients receiving treatment at Kembata Tembaro Zone Health Centers, SNNPR, Ethiopia, 2021 (n=91)

| Characteristics    |                     | Frequency | Percentage |
|--------------------|---------------------|-----------|------------|
| Age                | 15-24               | 34        | 37.4       |
|                    | 25-34               | 15        | 16.5       |
|                    | 35-44               | 20        | 21.9       |
|                    | >=45                | 22        | 24.2       |
| Sex                | Male                | 47        | 51.6       |
|                    | Female              | 44        | 48.4       |
| Religion           | protestant          | 74        | 81.3       |
|                    | Orthodox            | 11        | 12.1       |
|                    | Muslim              | 5         | 5.5        |
|                    | Catholic            | 1         | 1.1        |
| Residence          | Rural               | 64        | 70.3       |
|                    | Urban               | 27        | 29.7       |
| Educational status | no formal education | 34        | 37.4       |
|                    | Primary             | 34        | 37.4       |
|                    | Secondary & above   | 23        | 25.3       |
| Occupation         | Farmer              | 40        | 44         |
|                    | Student             | 30        | 33         |
|                    | Merchant            | 21        | 23         |

## Quality of DOTS delivery

Forty-four percent of patients responded that waiting before being served was unacceptable, and 59% of them were not served by the same health care provider. Most (76%) of the patients stated that they did not visit other health facilities for TB services. A total of 43 (47%) patients were counseled on the importance of the observed treatment. Sixty-nine percent of smear-positive TB patients were told about the need for follow-up sputum examination, and 77%

of them were told when the transmission stopped. Approximately 85% of patients responded that health care providers were respectful, and 62% of them mentioned that the providers listened carefully. Fifty-three percent of patients stated that the provider did not observe them while taking their drugs, and 64% of patients who were close contacts were not screened for TB (Table 5).

**Table 5:** Quality of TB DOTS delivery in public health centers in the Kembata Tembaro Zone, SNNPR, Ethiopia, 2021

|                                                   |     | Health Center Name |                    |                   |                |                    |                  |                  | Total<br>(n, %) |
|---------------------------------------------------|-----|--------------------|--------------------|-------------------|----------------|--------------------|------------------|------------------|-----------------|
|                                                   |     | Angecha<br>(n, %)  | Funemura<br>(n, %) | Damboya<br>(n, %) | Teza<br>(n, %) | Doyogena<br>(n, %) | Durame<br>(n, %) | Hadero<br>(n, %) |                 |
| Availability of TB services                       |     |                    |                    |                   |                |                    |                  |                  |                 |
| Acceptability of waiting time before being served | Yes | 6(60)              | 8(53.3)            | 7(53.8)           | 4(57.1)        | 6(50)              | 3(42.8)          | 17(62.9)         | 51(56)          |
| Attended by same provider                         | Yes | 3(30)              | 2(13.3)            | 4(30.7)           | 2(28.5)        | 7(58.3)            | 4(57.1)          | 15(55.5)         | 37(40.6)        |
| Availability of anti TB drugs                     | Yes | 10(100)            | 6(40)              | 13(100)           | 7(100)         | 12(100)            | 7(100)           | 27(100)          | 82(90)          |
| Went to other facility for TB services            | No  | 7(70)              | 9(60)              | 9(69.3)           | 4(57.1)        | 10(83.3)           | 6(87.7)          | 19(70.4)         | 69(76)          |
| Availability of service during working hours      | Yes | 5(50)              | 13(86.7)           | 8(61.5)           | 7(100)         | 9(75)              | 6(85.7)          | 21(77.8)         | 69(76)          |
| Communication and information                     |     |                    |                    |                   |                |                    |                  |                  |                 |
| Counseled on when transmission stops              | Yes | 4(50)              | 3(27.3)            | 7(87.5)           | 3(100)         | 4(80)              | 3(100)           | 23(100)          | 47(77)          |
| Counseled that TB is curable                      | Yes | 9(90)              | 9(60)              | 12(92.3)          | 7(100)         | 12(100)            | 7(100)           | 26(96.3)         | 82(90)          |
| Counseled on importance of observed treatment     | Yes | 6(60)              | 6(40)              | 7(53.8)           | 4(57.1)        | 6(50)              | 3(42.8)          | 11(40.7)         | 43(47)          |
| Counseled on side effect of anti-TB drugs         | Yes | 6(60)              | 8(53.3)            | 8(61.5)           | 7(100)         | 12(100)            | 7(100)           | 27(100)          | 75(82)          |
| Counseled on the need of sputum examination       | Yes | 4(50)              | 7(63.6)            | 7(87.5)           | 3(100)         | 4(80)              | 3(100)           | 14(60.8)         | 42(69)          |
| Counseled on duration of treatment                | Yes | 7(70)              | 6(40)              | 12(92.3)          | 7(100)         | 12(100)            | 7(100)           | 27(100)          | 78(86)          |
| Patient provider interaction                      |     |                    |                    |                   |                |                    |                  |                  |                 |
| Provider treat with respect                       | Yes | 9(90)              | 11(73.3)           | 9(69.2)           | 7(100)         | 8(66.7)            | 7(100)           | 26(96.3)         | 77(85)          |
| Provider invite to room and offer chair           | Yes | 9(90)              | 0(0)               | 10(76.9)          | 3(42.8)        | 0(0)               | 7(100)           | 27(100)          | 56(62)          |
| Provider listen carefully                         | Yes | 6(60)              | 5(33.3)            | 9(69.2)           | 3(42.8)        | 10(83.3)           | 4(57.1)          | 19(70.3)         | 56(62)          |
| Provider explain in a way you understand          | Yes | 7(70)              | 10(66.7)           | 8(61.5)           | 5(71.4)        | 8(66.7)            | 4(57.1)          | 17(62.9)         | 59(65)          |
| Privacy respected                                 | Yes | 4(40)              | 10(66.7)           | 7(53.8)           | 5(71.4)        | 7(58.3)            | 6(85.7)          | 17(62.9)         | 56(62)          |
| Professional competence                           |     |                    |                    |                   |                |                    |                  |                  |                 |
| Provider observe while taking drugs               | Yes | 6(60)              | 4(26.7)            | 6(46.1)           | 3(42.8)        | 0(0)               | 4(57.1)          | 20(74)           | 43(47)          |
| Provider examined your close contacts             | Yes | 3(30)              | 5(33.3)            | 5(38.4)           | 3(42.8)        | 5(41.7)            | 3(42.8)          | 9(33.3)          | 33(36)          |

Thirty-eight percent of patients were not invited to the TB room or were offered a chair by the DOTS provider. As observed in many of the health centers, the TB room is either very narrow or built of local material, which is substandard. One participant explained: “As you have seen now the TB unit is very narrow and it can’t even accommodate more than a person at a time; therefore, I only give them a drug through window like a shop keeper” (a 25-year-old male TB DOT provider).

### Another respondent added

“It is very difficult to construct a new room for the TB unit from the health center budget, and it is obvious that a quality service couldn’t be given in this

situation” (a 42-year-old Woreda TB focal). Additionally, there is also a lack of commitment among TB DOTS providers.

### One study participant stated

“There is no shortage of anti-TB drugs, but what we encounter in frequent times is that TB DOTS providers did not request the pharmacy store person in a timely manner using the internal facility request and report format” (a 34-year-old health center head). The overall quality of TB DOTS delivery in public health centers in the Kembata Tembaro zone was 75.95%, which is considered to be at a medium level according to the predetermined judgment criteria (Table 6).

**Table 6:** Judgment matrix for quality of TB DOTS delivery in public health centers in the Kembata Tembaro Zone, SNNPR, Ethiopia, 2021

| Indicators                                                                                                                                       | E  | O  | W  | S    | A     | JP                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------|----|----|----|------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| The proportion of patients who respond that the waiting time before being served is acceptable                                                   | 91 | 52 | 1  | 0.57 | 57.14 | >=85 High level of DOTS delivery<br>75-84.9 Medium Level of DOTS delivery<br><br>60-74.9 Low Level of DOTS delivery<br><=59.9 Poor Level of DOTS delivery |
| Proportion of patient who respond that they are served by the same provider                                                                      | 91 | 37 | 1  | 0.41 | 40.66 |                                                                                                                                                           |
| Proportion of patient who respond that anti-TB drugs are available when they require                                                             | 91 | 82 | 1  | 0.9  | 90.11 |                                                                                                                                                           |
| Proportion of patient who respond that they went to other health center for TB services or treatment                                             | 91 | 28 | 1  | 0.31 | 30.77 |                                                                                                                                                           |
| Proportion of patient who respond that services were available during the working hours of the health center                                     | 91 | 69 | 1  | 0.76 | 75.82 |                                                                                                                                                           |
| The proportion of patient who respond that DOTS provider told them when they stop spreading the disease                                          | 91 | 70 | 1  | 0.77 | 76.92 |                                                                                                                                                           |
| Proportion of patient who respond that DOTS provider told them that TB can be cured                                                              | 91 | 82 | 1  | 0.9  | 90.11 |                                                                                                                                                           |
| Proportion of patient who respond that DOTS provider told them about the importance of observed treatment                                        | 91 | 43 | 2  | 0.95 | 47.25 |                                                                                                                                                           |
| Proportion of patient who respond that the DOTS provider told them about side effects of TB drugs                                                | 91 | 75 | 1  | 0.82 | 82.42 |                                                                                                                                                           |
| Proportion of patient who respond that the DOTS provider told them about the need for sputum follow up tests                                     | 91 | 63 | 1  | 0.69 | 69.23 |                                                                                                                                                           |
| Proportion of patients who respond that the DOTS provider told them about the duration of TB treatment                                           | 91 | 80 | 1  | 0.88 | 87.91 |                                                                                                                                                           |
| Proportion of patient who responds that the TB care provider treat them with respect                                                             | 91 | 77 | 1  | 0.85 | 84.62 |                                                                                                                                                           |
| The proportion of patients who respond that TB care provider invite them into the room and offered chair                                         | 91 | 56 | 1  | 0.62 | 61.54 |                                                                                                                                                           |
| The proportion of patient responds pond that the TB care provider listens to them carefully                                                      | 91 | 56 | 1  | 0.62 | 61.54 |                                                                                                                                                           |
| The proportion of patient who respond that the TB care provider explains things in a way they understand                                         | 91 | 59 | 1  | 0.65 | 64.84 |                                                                                                                                                           |
| Proportion of patient who responds that the TB care provider respect their privacy during the examination                                        | 91 | 56 | 1  | 0.62 | 61.54 |                                                                                                                                                           |
| Proportion of patients who respond that the DOTS provider observed them while taking anti TB drug                                                | 91 | 43 | 2  | 0.95 | 47.25 |                                                                                                                                                           |
| Proportion of patients who respond that their close contacts were screened for TB in this health center                                          | 91 | 33 | 1  | 0.36 | 36.26 |                                                                                                                                                           |
| Overall Level of DOTS delivery                                                                                                                   |    |    | 20 | 12.6 | 75.95 |                                                                                                                                                           |
| *E: Expected, O: Observed, W: Weight, S: Score ((observed X weight)/Expected), A: Achievement in percentage ((S/W) *100), JP: Judgment Parameter |    |    |    |      |       |                                                                                                                                                           |

## Participant Responsiveness

One-third (66%) of the patients were satisfied with their daily visit to the health center for treatment, but 58.2% of them were satisfied with the amount of time spent waiting for the service. The majority (85.4%) of patients were satisfied with the availability of anti-TB drugs, while 70% of them were satisfied with the

availability of laboratory services when needed for sputum examination. The overall level of patient responsiveness toward TB DOTS was 69.34%, which is considered poor according to the predetermined set of judgment criteria and is comparable across all public health centers, with higher (77%) in the Damboya Health Center and lower (64.4%) in the Funemura Health Center (Tables 7 and 8).

**Table 7:** Responsiveness of TB patients to the TB DOTS service in public health centers in the Kembata Tembaro Zone, SNNPR, Ethiopia, 2021

| Level of responsiveness                     | Health center name |              |             |          |              |            |            | Total (%) |
|---------------------------------------------|--------------------|--------------|-------------|----------|--------------|------------|------------|-----------|
|                                             | Angecha (%)        | Funemura (%) | Damboya (%) | Teza (%) | Doyogena (%) | Durame (%) | Hadero (%) |           |
| On the daily visiting of health center      | 70                 | 71.7         | 77          | 60.7     | 66.7         | 53.5       | 61.1       | 66.2      |
| With the working hours of tb clinic         | 75                 | 71.7         | 78.8        | 71.4     | 72.9         | 60.7       | 73.1       | 72.8      |
| With the time spent in waiting service      | 65                 | 41.6         | 76.9        | 57.1     | 45.8         | 78.5       | 56.4       | 58.2      |
| With the availability of anti TB drug       | 65                 | 35           | 76.9        | 64.2     | 75           | 85.7       | 65.7       | 64.8      |
| With the availability of laboratory service | 68.7               | 70.4         | 75          | 83.3     | 75           | 66.6       | 66.3       | 70        |
| With the friendliness of dots provider      | 75                 | 75           | 75          | 67.8     | 66.7         | 82.1       | 82.4       | 76        |
| To the providers respect                    | 75                 | 75           | 76.9        | 78.5     | 75           | 78.5       | 76.8       | 76.3      |
| With the explanation of provider            | 67.5               | 75           | 80.7        | 67.8     | 68.7         | 78.5       | 74         | 73.6      |
| Overall responsiveness level                | 70.15              | 64.4         | 77.15       | 68.8     | 68.2         | 73         | 69.4       | 69.1      |

**Table 8:** Judgment matrix for participant responsiveness to TB DOTS in public health centers in the Kembata Tembaro Zone, SNNPR, Ethiopia, 2021

| Indicators                                                                                                               | E* | O* | W* | S*    | A*    | Judgment parameter                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------|----|----|----|-------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Proportion of patient's responsiveness on the daily visiting of health center for TB treatment                           | 91 | 60 | 3  | 1.98  | 65.93 | ≥85% = High Level of responsiveness<br>75% - 84.9% = Medium level of responsiveness<br>60% - 74.9% = Low level of responsiveness<br>≤59.9% = Poor level of responsiveness |
| Proportion of patient's responsiveness on the working hours of TB clinic                                                 | 91 | 66 | 2  | 1.45  | 72.53 |                                                                                                                                                                           |
| Proportion of patient's responsiveness with the time spent in waiting for service                                        | 91 | 53 | 2  | 1.16  | 58.24 |                                                                                                                                                                           |
| Proportion of patient's responsiveness with the availability of anti- TB drugs                                           | 91 | 59 | 3  | 1.95  | 64.84 |                                                                                                                                                                           |
| Proportion of patient's responsiveness with the availability of laboratory service                                       | 91 | 64 | 3  | 2.11  | 70.33 |                                                                                                                                                                           |
| Proportion of patient's responsiveness with the friendliness of TB dots provider                                         | 91 | 70 | 2  | 1.54  | 76.92 |                                                                                                                                                                           |
| Proportion of patient's responsiveness with the dots provider respect and willingness to respond to questions            | 91 | 70 | 2  | 1.54  | 76.92 |                                                                                                                                                                           |
| Proportion of patient's responsiveness with the competence of dots provider                                              | 91 | 65 | 3  | 2.14  | 71.43 |                                                                                                                                                                           |
| Overall score of participant responsiveness                                                                              |    |    | 20 | 13.87 | 69.34 |                                                                                                                                                                           |
| *E: expected, O: observed, W: weight, S: score ((observed x weight)/expected), A: achievement in percentage ((S/W) *100) |    |    |    |       |       |                                                                                                                                                                           |

## Facilitation Strategies

Most Woredas (districts) provide regular supportive supervision to health centers every quarter, and the TB program is one of the areas of focus during supervision, but there is no specific supportive supervision regarding the TB program.

### A 39-year-old woman with focal TB stated the following

"There was a quarterly meeting and supportive supervision in the TB program last year, which was organized with the assistance of the Challenge TB project. However, currently, there is no organization available to organize such events, and the Woreda has insufficient funds to host them."

### Another respondent added

"I have been working at the TB clinic for the past year and a half, but I have not yet received any feedback regarding the services provided here" (a 25-year-old DOTS provider). There were no mechanisms to motivate TB DOTS providers in the health centers.

### One of the DOTS providers explained the issue as follows

"I do not receive any compensation for working at this clinic. I call patients when their treatment is interrupted, and sometimes I even pay for transportation to visit them at their home out of my own pocket" (a 29-year-old male TB DOTS provider).

### Intervention Complexity

Most of the health centers use the national TB treatment guidelines, and there is no difficulty in understanding the protocols currently used to treat patients.

A TB DOTS provider mentioned

“I give the combination of the RHZE drug for the first 2 months based on their weight and RH for the remaining 4 months for pulmonary TB patients, but for extrapulmonary patients, the duration of the continuation phase may extend up to 10 months” (a 40-year-old female TB DOTS provider).

Another participant added

“The TB medications are prepared in a kit and one kit is enough for a patient who took 3 tabs per day, and the blisters’ color differs for the drugs taken in the intensive and continuation phases” (A36-year-old male TB DOTS provider). Almost all DOTS providers stated that providing daily DOTS to patients at health centers is challenging.

A participant stated

“I want to follow the progress of my patients, but appointing them to come daily for taking drugs is very difficult, as most of them are weak due to the disease, and the cost of transportation is also a challenge for them” (a 26-year-old male TB DOTS provider).  
A 35-year-old female DOTS provider added

“Instead of appointing my patients to come daily to the health center, I give the patients drugs to the health extension worker and communicate with her about the patient’s progress.”

Availability

Human Resources

Of the 8 TB DOTS providers, half were health officers, and the rest were nurses. Among the DOTS providers, five had been trained in comprehensive TB care. With respect to experience, all of them had at least 4 years of clinical experience, and 3 of them had at least 2 years of experience in providing DOTS (Table 9). One of the key informant participants stated, "Last year, we had two trained TB treatment professionals at our health center. However, both of them have left to work at the Worna Hospital. We are currently providing TB treatment services with untrained health professionals" (a 27-year-old health center head).

Another respondent added

“Due to a shortage of budget, we couldn’t conduct refreshment training for professionals working in the TB clinics” (a 42-year-old male woreda TB focal).

**Table 9:** Distribution of human resources available for use in the TB unit of the Kembata Tembaro Zone Health Centers, SNNPR, Ethiopia, 2021

| Health center name | TB dots provider |                             |                                 |             |                        |
|--------------------|------------------|-----------------------------|---------------------------------|-------------|------------------------|
|                    | Profession       | Clinical experience (years) | Experience in TB Clinic (years) | Training    | Year training attended |
| Angecha            | Nurse            | 10                          | 1                               | Trained     | 2016                   |
| Funemura           | Health Officer   | 4                           | 2                               | Trained     | 2018                   |
| Damboya            | Nurse            | 8                           | 3                               | Trained     | 2019                   |
| Teza               | Health Officer   | 12                          | 4                               | Trained     | 2020                   |
| Doyogena           | Nurse            | 10                          | 6 Month                         | Not trained |                        |
| Durame             | Health Officer   | 4                           | 1                               | Not trained |                        |
| Hadero             | Health Officer   | 6                           | 8 Month                         | Not trained |                        |
| Mare               | Nurse            | 5                           | 1                               | Trained     | 2020                   |

Guidelines and registrations

All the public health centers had standard Unit TB and AFB registrations, but there was no standard TB treatment guideline for two of them, namely, Doyogena and Mare health centers.

One respondent described

“We have requested the woreda to give us a guideline, but they reported that the guideline is not available; then, we have decided to copy the training manual and availed it in the TB unit” (a 34-year-old male head of health center).

Drugs and Medical Supplies

Anti-TB drugs were available at all of the public health centers, but AFB reagents, specifically acid alcohol, were available in the past month at two of the public health centers, namely, Doyogena and Mare Health Centers. The Functional Adult Weight Scale is available only for three public health center TB clinics, namely, Teza, Durame and Hadero health centers. A 45-year-old male woman with TB stated, “Previously, there were NGOs that supplied reagents and other medical supplies, but now no one is supporting the TB program, and there is a frequent interruption of reagents in the health centers”. Additionally, there is a problem with the availability

of reagents, as stated by one of the health centers heads: “Reagents, especially acid alcohol, are frequently reported shortages, and buying this reagent from the market is possible, but there is an issue of quality in the reagents that are not guaranteed” (A 34-

year-old male health center head). The overall level of availability in the public health centers of the Kembata Tembaro zone is 81%, which is labeled a medium level according to the predetermined set of judgment criteria (Table 10).

**Table 10:** Judgment matrix for TB DOTS service resource availability in public health centers in the Kembata Tembaro Zone, SNNPR, Ethiopia, 2021

| Indicator                                                                                                                | E | O | W  | S     | A    | Judgment parameter                                                                          |
|--------------------------------------------------------------------------------------------------------------------------|---|---|----|-------|------|---------------------------------------------------------------------------------------------|
| Proportion of health center with trained DOT provider                                                                    | 8 | 5 | 3  | 1.9   | 62.5 | ≥85% = High Level<br>75% - 84.9% = Medium level<br>60% - 74.9% = Low level<br>≤59.9% = Poor |
| Proportion of health center with TB treatment providing unit available                                                   | 8 | 8 | 3  | 3     | 100  |                                                                                             |
| Proportion of health center with no stock out of anti TB drugs in the past 1-month period                                | 8 | 8 | 3  | 3     | 100  |                                                                                             |
| Proportion of health center with no stock out of AFB reagent in the past 1- month period                                 | 8 | 6 | 4  | 3     | 75   |                                                                                             |
| Proportion of health center with functional adult weight scale in the TB unit                                            | 8 | 3 | 3  | 1.1   | 37.5 |                                                                                             |
| Proportion of health center with AFB registration                                                                        | 8 | 8 | 3  | 3     | 100  |                                                                                             |
| Proportion of health center with standard unit TB register                                                               | 8 | 8 | 3  | 3     | 100  |                                                                                             |
| Proportion of health center with standard treatment guideline                                                            | 8 | 6 | 3  | 2.25  | 75   |                                                                                             |
| Overall score of availability                                                                                            |   |   | 25 | 20.25 | 81   |                                                                                             |
| *E: expected, O: observed, W: weight, S: score ((observed x weight)/expected), A: achievement in percentage ((S/W) *100) |   |   |    |       |      |                                                                                             |

## Discussion

The present evaluation findings show that the overall level of fidelity of implementation in public health centers in the Kembata Tembaro zone was low (73.9%) based on the judgment parameter. The adherence of health care providers to the national TB treatment guidelines was low (73.1%), and the quality of TB treatment delivery was moderate (75.95%). TB patients' responsiveness to the TB treatment service received was low (69.4%), and the availability of needed resources for TB treatment provision was moderate (81.2%).

## Adherence

The national guidelines recommend that an appropriate anti-TB regimen with the correct dosage be prescribed to all TB patients (5). In line with this, the current study showed that almost all (99.7%) patients received a correct drug regimen during the intensive phase of treatment, and more than eight of the ten (87.2%) patients received this regimen during the continuation phase. This might be due to the easily understandable nature of the current treatment protocol and the preparation of combined anti-TB drugs. This finding is comparable to that of a study conducted in South Asia, which showed that approximately 90% of patients received a correct drug regimen (16). Another study conducted in health facilities of the Bahir Dar city Administration also

showed that 94.4% of patients received the correct anti-TB drug regimen (17). In addition, the current study revealed that 96.3% and 82.8% of TB patients received the correct anti-TB drug dosage during the intensive and continuation phases, respectively. This finding is comparable with that of a study conducted at Limmu Genet District Hospital, Oromia region, in which 86.8% of the patients were affected in both phases (18). The current finding was lower than that of the study in South Asia, which was 100% during both phases of treatment. This difference might be because the study was conducted in southern Asia and has an inpatient TB care unit, unlike our study setting. However, the findings of the present study are greater than those of a study conducted in public health facilities in Southwest Ethiopia, in which 91% of the participants were in the intensive phase and 52.7% were in the continuation phase (19). This difference might be due to differences in the study setting, sample size, or method. Our study used both qualitative and quantitative methods, whereas the study in the southwestern region used only quantitative methods. Our study showed that sputum follow-up examinations were performed for 79% of the pulmonary TB patients who were smear positive at the 2<sup>nd</sup> month of treatment, 64.7% at the 5<sup>th</sup> month, and 66.9% at the 6th month. However, according to the national TB treatment guidelines, AFB microscopic examination should be requested for all

bacteriologically confirmed TB patients at the end of the 2<sup>nd</sup>, 5<sup>th</sup> and 6<sup>th</sup> months of treatment (5). The difference observed in the current study might be due to the absence of trained health care providers assigned full-time to the TB units and due to the interruption of the acid alcohol reagent. Another study conducted in public health facilities of the Southern Nations Nationalities and Peoples Region showed that sputum smear examination was performed for 63.8% of patients at the 2<sup>nd</sup> month, 18.4% at the 5<sup>th</sup> month, and 17.8% at the 6<sup>th</sup> month of treatment, which is far below the findings of the current study (20). The findings of the present study also showed a better result than those of the study in the Limmu cohort in the Oromia region, in which only 55% of patients had sputum examination at the end of the intensive phase (18). This discrepancy might be due to differences in the study setting and methods. A previous study only used facilities from rural areas, whereas our study used facilities that had better access to human and material resources. It is recommended in the national guidelines that all TB patients be screened for HIV at the time of treatment initiation (5). In the present study, more than nine in ten (92%) patients provided HIV, possibly due to the assignment of untrained health care providers to the TB unit. The findings of the present study are comparable to those of a study performed in Nepal, which reported a prevalence of 91.5% (21). Studies conducted in public health facilities in Debre Tabor town and in the East Wollega and Wolaita Sodo zones have shown approximate results of 98.9%, 96% and 98%, respectively, for patients screening for HIV (9,22,23). According to the national TB treatment guidelines, all pulmonary smear-positive TB patients should receive drug susceptibility tests (5). In contrast, our evaluation showed that DST was performed for only one-fifth of pulmonary smear-positive patients. This discrepancy might be due to the knowledge gap among TB DOTS providers due to a lack of refreshment training. The findings from this study showed that approximately 83% of patients' weight was measured at the start of the continuation phase of treatment. However, according to the national TB treatment guidelines, all TB patients' weights should be measured and kept at the proper drug dose at the end of intensive phase treatment (5). This difference might be due to the lack of functional weight measurements in the TB unit and lack of commitment among the health care providers. The findings of the present study are comparable to those

of a study performed in southwestern Ethiopia, which was 82.7% and greater than that of a study conducted in Debre Tabor town, which was 63% (19,22). This discrepancy might be because of the differences in the study period and sample size. Our evaluation showed that 73.11% of TB DOTS services were implemented in line with national standards and revealed that many of the services were not consistent with national guideline recommendations.

### Moderators

**Quality of TB DOT delivery:** The national TB treatment guideline recommends that TB care providers be caring, respectful and compassionate while providing the service to all TB patients. In our study, approximately 62% of patients were invited to the room and offered a chair by TB DOT providers; these findings are congruent with the findings of a study performed in the Bahir Dar city administration, which reported that 67% of clients were invited to the room-offered chair (17). However, this is much lower than that reported in a study conducted in public health facilities in the Ilu Aba Bor Zone, in which the prevalence was 95.4% (24). This difference might be due to the substandard level of TB units in most of the health centers in the current study area and differences in compassionate care between health care providers. The current study revealed that approximately 47.3% of the TB patients were informed about the importance of observed treatment, which is lower than that reported in a study conducted in the Bahir Dar city administration and Ilu Aba Bor Zone, which reported 59.9% and 59.6%, respectively (17,24). This discrepancy might be due to differences in the measurements of the variables. In our study, the variable was measured both via self-reports and direct observation; however, the studies of Bahir Dar and Ilu Aba Bor used only one of these variables. The present study revealed that 64.8% of patients responded that TB care providers explain things in a way that they understand, and this percentage is lower than that reported in a study conducted in health facilities in North Shewa, which was 88.9% (25). This discrepancy might be due to the number of trained TB DOTS providers and the number of samples used in the studies. The overall quality of TB DOT services was 75.9%, which is medium and needs improvement.

### Participant Responsiveness

Findings from our evaluation revealed that patient satisfaction with the appropriateness of working

hours was 72.8%, which is in line with the findings of studies conducted in North Shewa (25). Another study conducted in the Ilu Aba Bor zone also showed an approximate result of 79% (24). According to this study, the percentage of patients with respect to respect to the respect given by health care providers was 77%, which is higher than that reported in both the North Shewa and Ilu Aba Bor zones, which were 72.5% and 67.9%, respectively (24,25). This difference might be due to the study setting and because our study included only health centers, for which the load of clients was less than that in the Ilu Aba Bor zone, which includes both health centers and hospitals. Another reason might be the difference in delivering compassionate care among TB DOTS providers. In this study, 58.2% of patients were satisfied with the waiting time before being served, which is congruent with the findings of a study conducted in Bahir Dar city (56.2%) (17) but lower than those of a study performed in the North Shewa and Ilu Aba Bor Z (74% and 77.8%, respectively) (24,25). This discrepancy might be due to the absence of a full-time assigned TB DOTS provider at the health centers. The other finding of the present study was that patient satisfaction with the competence of TB DOTS providers was 71%, which was lower than that reported in studies conducted in the North Shewa Zone and Bahir Dar City administration, which were 75% and 83.3%, respectively (17,25). This difference might be because the studies conducted in North Shewa and Bahir Dar included both health centers and hospitals where a service was provided to advanced health professionals. Another reason could be the difference in the sample size used in the studies. Moreover, the findings showed that extrapulmonary TB patients were more likely to experience dissatisfaction than pulmonary TB patients were. This may be due to the long duration of treatment among the EPTB patients and the additional ancillary drugs prescribed for them. The satisfaction of patients with the overall TB DOT was 69%, which is low and indicates the need for improvement. Availability of resources: The findings of our evaluation showed that the TB treatment unit, anti-TB drugs, AFB registers and unit TB registers were 100% available in public health centers, which is congruent with the recommended guidelines (26). Other findings from this evaluation showed that more than half of the public health centers in the TB room had no functional adult weight scale. The national TB treatment guideline recommends an adequate and

uninterrupted supply of reagents as part of programmatic activities to achieve sustainable program implementation (5). The unavailability of AFB reagent was due to the phase out of the NGO, which was used to supply public health centers, and to the issue of guaranteeing commercially available reagents. Moreover, TB DOTS were given by untrained professionals in more than one-third of the public health centers. This was due to the turnover of trained professionals and the absence of refreshment training due to budget shortages. This finding is lower than the service availability and readiness assessment conducted in public health facilities in Ethiopia, which showed that 71% of health centers have at least one trained health care provider for TB DOTS (13). All of the health centers have separate rooms for TB treatment, but only two of them have a standard TB unit with a waiting room. The World Health Organization (WHO) and Ethiopian Food and Drug Authority (EFDA) recommend that TB rooms be at least 8 square meters long, with windows as large as a minimum of 150\*200 cm in the opposite direction to each other and walls as high as 2.5 meters. Accordingly, most (75%) of the health centers in the current study were below the standard, possibly because the COVID-19 pandemic demands significant attention and resources; additionally, programme managers have given less attention to programmes that are true for other programmes, leading to inadequate resource allocation and infrastructure (5,14). The present evaluation revealed that one of the constraints in the provision of TB treatment is the lack of necessary resources, which has implications for patients, as the service provision was less than the required amount for targeted beneficiaries.

### Limitations of the study

One of the limitations of this study was that since the study was conducted at the health center level, patients might have responded in a relatively positive way, social desirability bias, by fearing being recognized. This issue was addressed by ensuring that their response was only for research purposes. The other limitation was the difficulty in extracting the required data from a unit TB register since many of the recorded data were not recorded completely. This issue was mitigated by reviewing additional registers such as the laboratory AFB register and by methodological triangulation.

### Conclusion

Resources for TB DOTS are moderately available, but there is a shortage of trained health care providers and frequent stock outs of AFB reagents. Additionally, functional adult weight scales are not available at TB units. Adherence to DOTS provider guidelines is low, with substandard patient sputum follow-up examinations, nutritional assessments, drug susceptibility tests, and weight monitoring. The study showed that the quality of TB DOTS delivery is moderate. Specifically, patients were not always treated by the same provider; they were not consistently counseled on the importance of observed treatment or the need for sputum examination, and providers did not dedicate enough time to actively listen to their patients. Our study revealed a low level of patient responsiveness to the provided DOTS. Patients reported dissatisfaction with their daily visits to the health center for TB treatment and long wait times, and patients perceived the DOTS providers as incompetent. The results of this evaluation can guide decision makers at various levels to address specific problem areas and take appropriate action.

## Abbreviations

AFB: Acid-fast bacillus; DOT: Direct observed treatment; DOTS: Direct Observed Treatment **Short-course**; HIV: Human Immunodeficiency Virus; MDR-TB: Multidrug-Resistant **Tuberculosis**; MTB: Multidrug-Resistant Tuberculosis; SNNPR: Southern Nations Nationalities **People Region**; TB: Tuberculosis; WHO: World Health Organization.

## Declarations

### Ethical consideration

Ethical clearance was obtained from the institutional review board of Jimma University and from the faculty of public health with reference number JHRPGD/53/21, and permission letters were obtained from the Kembata Tembaro Zone health department and from each facility before data collection. Prior to participation, the study participants were given a brief explanation of the purpose, benefits, and risks of the evaluation. Informed written consent was obtained from all participants. To ensure confidentiality, names were not used; instead, coded numbers were assigned to represent the results, and the questionnaires were kept locked. For those participants who could not read or write, informed consent was obtained from their authorized legal representatives.

## Availability of data and materials

The data will be available upon request from the corresponding authors.

## Consent for publication

This approach is not applicable.

## Competing interests

All the authors declare that they have no competing interests.

## Funding

This study did not receive any specific funding from external agencies. Nonetheless, the study budget was supported by the postgraduate school at Jimma University. It is important to note that the university was not involved in the study design or conceptualization.

## Authors' contributions

TL developed the proposal, carried out the data collection, conducted the analysis, was involved in reviewing the manuscript, had full access to all the data in the study and had final responsibility for the decision to submit for publication. BME and YS provided general guidance on the overall study progress and participated in reviewing the proposal, reviewing the analysis and participating in the final study document development. SS, AT, DA and TG participated in the data collection management. AM and TL were involved in analyzing the data and reviewing the manuscript draft. AM wrote the first draft of the manuscript. All the authors read and approved the final manuscript and are accountable for all the aspects of the work.

## Acknowledgments

We are very grateful to Jimma University for its technical and financial support. We would also like to thank the Kembata Tembaro Zone health department staff and all of the study participants who participated in this evaluation for their information and commitment. We also appreciate the data collectors and supervisors for their unreserved contributions.

## References

1. World Health organization. Global tuberculosis report (2022). Geneva.
2. Thomas M. Daniel. (2006). The history of tuberculosis, *Respir Med*.100(11):1862-1870.
3. World Health Organization. (2020). Global tuberculosis report 2020. Geneva.
4. World Health Organization. (2019). Global tuberculosis report 2019. Geneva. Geneva.

5. Federal Ministry of Health Ethiopia. (2017). National guidelines for TB, DR-TB and Leprosy in Ethiopia. 6th ed. Addis Ababa: Ministry of health.
6. Federal Ministry of Health Ethiopia. (2018). Implementation Guide for Tuberculosis Prevention and Control Program Through Public–Private Mix Approach in Ethiopia. 75.
7. Woimo TT, Yimer WK, Bati T, Gesesew HA. (2017). The prevalence and factors associated for anti-tuberculosis treatment nonadherence among pulmonary tuberculosis patients in public health care facilities in South Ethiopia: a cross-sectional study, *BMC Public Health*. 17(1):1-10.
8. Fiseha. D, Demissie. M. (2015). Assessment of Directly Observed Therapy (DOT) following tuberculosis regimen change in Addis Ababa, Ethiopia: A qualitative study. 15(1):1-9.
9. Muluye AB, Kebamo S, Teklie T AG. (2018). Poor treatment outcomes and its determinants among tuberculosis patients in selected health facilities in East Wollega, Western Ethiopia, *PLoS*. 13(10):1-15.
10. Desalegn D. (2017). Factors affecting tuberculosis case detection in Kersa District, South West Ethiopia, *J Clin Tuberc Other Mycobact Dis*. 1-4.
11. Southern Nations Nationalities Peoples Regional Health Bureau. (2020). Reports of Integrated Joint Supportive Supervision JSS in Kembata Tembaro.
12. L.G. Sambo, R.R. Chatora, E.S.M. Goosen. (2003). Tools for Assessing the Operationality of District Health Systems. Brazzaville, WHO Reg Offi Africa.
13. Ethiopian public health institute. (2018). Services Availability and Readiness Assessment (SARA) Ethiopian Public Health Institute Ethiopia Service Availability and Readiness Assessment (SARA).
14. World health organization. (2019). Who guidelines on tuberculosis infection prevention and control.
15. Sara M, Jacques B and, Anke K. (2018). Quality of care as seen through the eyes of the patient (QUOTE) TB Light. The Hague.
16. Dorji K, Lestari T, Jamtsho S, Mahendradhata Y. (2020). Implementation fidelity of hospital based directly observed therapy for tuberculosis treatment in Bhutan: Mixed-method study. *BMC Public Health*. 20(1):1-12.
17. Mulatu Kassie, Amanu Aragaw, Alemayehu Belay. (2014). Assessment of the Quality of Directly Observed Treatment Short-Course of Tuberculosis in Bahir Dar City Administration, North West Ethiopia, *Sci J Public Heal*. 2(1):6-13.
18. Tadesse L, Oljira H. (2017). Evaluation of Quality of Tuberculosis Care in Limmu Genet District Hospital, Oromia Region, Ethiopia, 37:1-10.
19. Dangiso DD, Logita DH. (2016). Process Evaluation of Quality in the Diagnosis and Treatment of Tuberculosis in Public Health Facilities of Southwes Ethiopia, *Cross Sectional Study*. 156-162.
20. Asres, A., Jerene, D. & Deressa W. (2016). Tuberculosis treatment outcomes of six- and eight-month treatment regimens in districts of Southwestern Ethiopia: A comparative cross-sectional study, *BMC Infect Dis*. 2016;16(1):1-8.
21. Kumar, R., Probandari, A., Ojha B et al. (2019). Implementation fidelity of provider-initiated HIV testing and counseling of tuberculosis patients under the National Tuberculosis Control Program in Kathmandu District of Nepal Implementation research, *BMC Health Serv Res*. 19(1):1-9.
22. Genet C, Melese A, Worede A. (2019). Effectiveness of directly observed treatment short course (DOTS) on treatment of tuberculosis patients in public health facilities of Debre Tabor Town, Ethiopia: Retrospective study. *BMC Res Notes*. 12(1):1-5.
23. Yakob B, Alemseged F, Paulos W BA. (2018). Trends in Treatment Success Rate and Associated Factors among Tuberculosis Patients in Ethiopia: A Retrospective Cohort Study, *Heal Sci*.
24. Sileshi Dubale et al. (2017). Quality and Treatment Outcomes of Directly Observed Treatment of Short-Coarse of Tuberculosis (DOTS) in South West Ethiopia: A cohort study, *Ind Am J Phar Res*. 7(02).
25. Balkew A. et al. (2020). Quality of Care Delivered to Tuberculosis Patients among Public Hospitals in Central Northeast Ethiopia, 30(5):671-680.
26. TB\_TB HIV 6th FMOH. TBTB/HIV Guideline 6th dition. 2017;(November). Supporting information. S1 Text: Data Extraction Tool for Document Review S2 Text: Resource Inventory Checklist.

**Cite this article:** M. Awoke, L.G. Tewodros, A. Yisalemush, S. Samrawit, T. Aklilu et al. (2024). Implementation fidelity of direct observation treatment and short-term treatment for tuberculosis in public health centers in the Kembata Tembaro Zone, Southern Nations Nationalities and People Region, Ethiopia. *Clinical Case Reports and Studies*, BioRes Scientia Publishers. 5(6):1-15. DOI: 10.59657/2837-2565.brs.24.135

**Copyright:** © 2024 Awoke Masrie, this is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

**Article History:** Received: May 16, 2024 | Accepted: May 30, 2024 | Published: June 06, 2024