



## TB Specimen Transportation Model as a Strategy for Increasing Service Access through Toss-TBC

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### Abstract

The proportion of TB RO cases in 2015 was 228 cases, an estimated 2% of new TB cases were 5 cases and 12% of TB re-treatment cases were RO TB cases. access to TB services through island-based TOSS-TB in Ambon City in 2022. This research is a descriptive study with an observational approach and a SWOT analysis using a qualitative SWOT matrix to analyze internal and external factors on the subject and research object, which will then be used to design a model transport of TB specimens. The research results obtained an overview of the TB specimen transportation system network system in Ambon City in 2022 3 health centers TCM laboratory with a network system, there are 19 health centers, TB specimen referral mechanism at the Ambon City Health Service in 2022 carried out by 19 Referral Health Centers, Test examples from aspects of packaging and Referrals at the Ambon City Health Office in 2022 are carried out by 19 Community Health Centers as referral health centers for the process of sending specimens to the TCM Laboratory and Reviewing and analyzing aspects of examination results reporting in the framework of the City of Ambon City Health Service 2022 online using Form TB 05 from the TCM Laboratory Health Center to the Referral Health Center.

## Introduction

World Health Organization in 2020, in 2019 the prevalence rate of pulmonary tuberculosis in the world was 13.0 million sufferers equivalent to 174 per 100,000 population with an incidence rate of 8.0 million sufferers equivalent to 133 cases per 100,000 population and 1.1 million deaths equivalent to 16 per 100,000 population, of all diagnosed TB patients, as many as 1.2 million people (12%) of whom are HIV positive TB patients. The most cases are in Asia (58%) and the African region (28%). Indonesia is one of the three countries that contributes the largest incidence of pulmonary TB in the world which when combined with India and China reaches 43% of the incidence of pulmonary TB in the world (WHO, 2020).

Drug Resistant Tuberculosis (RO TB) is a world health problem. Based on the world health organization (World Health Organization/WHO) in 2019 globally it is estimated that 3.3% of new TB patients and 17.7% of previously treated TB patients are drug-resistant TB patients. In addition, it is estimated that there are 9.96 million TB incidents worldwide, of which 465,000 are MDR TB / RR TB. Of the estimated 465,000 TB RO patients, only 206,030 were found and 177,099 (86%) were treated, with a global treatment success rate of 57%. The estimated RO TB in Indonesia is 2.4% of all new TB patients and 13% of TB patients who have been treated with a total estimated incidence of RO TB cases of 24,000 or 8.8/100,000 population.

Ambon City is a cluster center and is one of the TB referral centers in Maluku Province with the highest Case Notification Rate compared to other Regencies/Cities. The high number of reported sensitive TB cases is not comparable to the reports of drug resistant TB (RO) (Mekonnen et al., 2015). This can be seen from the use of the Rapid Molecular Test (TCM) tool as the main tool for detecting TB RO patients, which has not been used properly by hospitals and health centers in Ambon City. This is because the sputum transportation network between health facilities has not yet been formed properly.

The proportion of TB RO cases in 2020 is 110 cases, it is estimated that 12% of new TB cases and 16.8% of re-treated TB cases are RO TB cases. The use of TCM tools in Ambon City until June 2021 is only 10% with a total of 20 cases of TB RO treatment.

Factors that can influence the implementation of the TB TOSS movement, find out how; Improving access to quality services, innovative diagnostic tools and devices, drugs by means of; Guarantee the availability of TB drugs and get cured by means of; Monitoring of laboratory and clinical treatment, Supervision of drug swallowing, Recording and reporting, Home and environmental visits and Promotion and prevention of transmission, in an effort to increase the declaration of TOSS TB in island areas with intensive, active and massive case finding is the goal of preventing and controlling TB disease in the community, a strategic approach based on island clusters, by optimizing the roles and functions of cluster centers (puskesmas central clusters) in an effort to increase program utilization, access, and affordability is a very important strategy to implement.

Based on the description above, our research team wants to conduct a research on the Strategy for Increasing Access to TB Services through Cluster-Based TOSS-TB in Ambon City in 2022.

## Methods

This research is a descriptive study with an observational approach and SWOT analysis using a qualitative SWOT matrix to analyze internal and external factors on the subject and object of the study, which will then be used to design a model for transporting TB specimens based on island clusters.

The population in this study were all TB officers in the 22 City Center Health Centers. Based on the consideration of the total population, the sample size was taken from the entire population or using exhaustive sampling so that the number of samples in this study totaled 22 people.

## Results and Discussion

### Description of the TB Specimen Transport System Network

The TB specimen transport network system is implemented at health facilities in the city of Ambon, there are 7 TCM laboratories in 2021, namely BPKM, Ambon Class II Environmental Health Engineering Center, Haulussy Hospital, and at 3 puskesmas namely Waihaong Health Center, Poka Health Center and Passo Health Center and with the following network system:

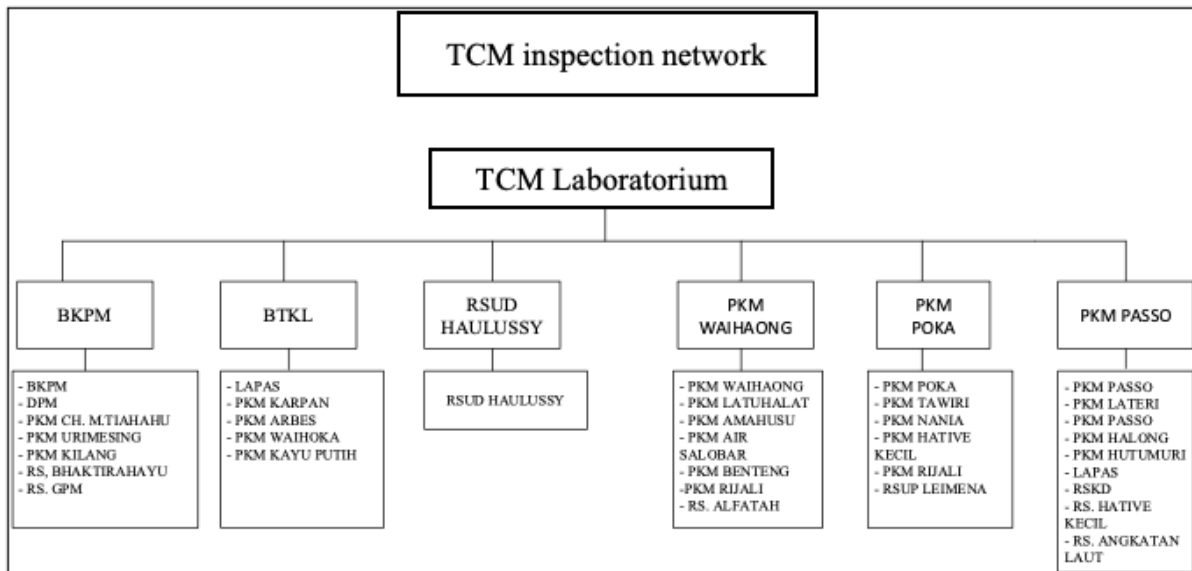


Figure 1. TCM inspection network system in Ambon City

Figure 1 above shows that there are 7 TCM laboratories in the city of Ambon with the following network system for BKPM the BPKM network system, DPM, CH.M.Tiahahu Health Center, Urimesing Health Center, Refinery Health Center, Rs Bhaktirahayu, Hospital GPM, network system for BTKL namely Lapas , Karpan Health Center, Air Besar Health Center, Waihoka Health Center, Kayu Putih Health Center, for the haulussy hospital network system is Haulussy Hospital, for the network system for the Health Center for Waihaong Health Center, namely Waihaong Health Center, Latuhalat Health Center, Amahusu Health Center, Air Salobar Health Center, Benteng Health Center, Health Center Rijali, Alfatah Hospital, while the network system for the Passo Health Center network system is the Tawiri Health Center, Nania Health Center, Hative Health Center, Rijali Health Center and Leimena Hospital in 2022 has its own TCM with the Leimena Hospital network system, and the Passo Health Center network system is Lateri Health Center, Halong Health Center, Hutumury Health Center, Lapas, RSKD, Hative Kecil Hospital, Angk Hospital or the Sea.

### Description of TB Specimen Referral Mechanism

The TB specimen referral mechanism at 22 puskesmas in Ambon City illustrates that 19 puskesmas that do not yet have Rapid Molecular Test (TCM) only carry out contact investigations, while TB specimen referrals for sputum specimen samples will be sent to TB service centers, namely 3 puskesmas that have TCM, can seen in the picture below:

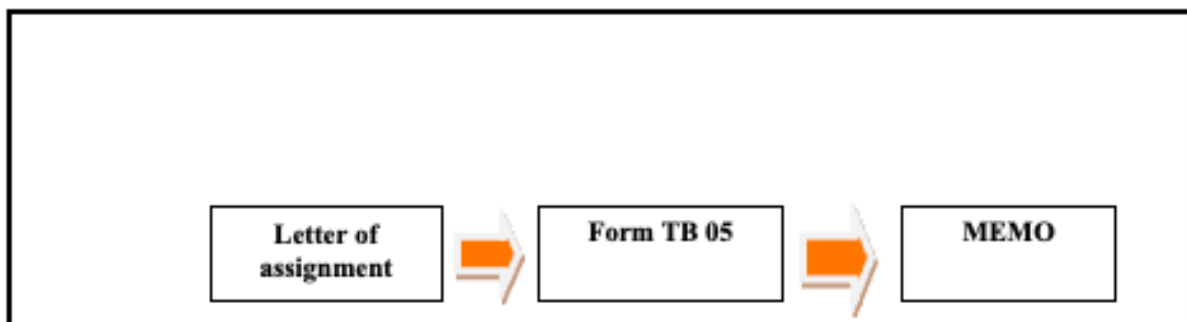


Figure 2. TB Specimen Referral Mechanism

Figure 2 illustrates the TB specimen referral mechanism explaining that laboratory analysts at each TCM health center or TB program holders at the health center bring the online TB 05 form along with the pot that gives the TB specimen to the TCM health center

according to their network. If brought by the patient, the patient must bring a cover letter from the referral health facility and TB form 05 as well as a sputum container for testing suspected TB and TB RO. The results of the examination will be conveyed by the TCM laboratory staff to TB program holders at the referral health center. For patients who have positive results, they will proceed to the stage of treatment carried out by the referral health center. The stages of treatment carried out for patients who have been confirmed as BTA+ after a TCM examination are carried out among AFB+ patients who come from referral health centers, the patient must undergo treatment at these health facilities and monitoring must be carried out by TB program holders, but there are cases of transfer in from referral health centers to network health centers to carry out treatment for sufferers, but the referral health center continues to investigate close contacts at the domicile of Health Facilities. The transportation used by TB program holders to carry out the referral system is personal transportation and the holder's officers also act as couriers to deliver TB specimens to health centers that have TCM, fees claimed by requesting officers every month and no later than 3 months with details of the allocated financing are costs for packing and sending tests from referral health facilities to TCM health facilities, costs for sending test samples from health facilities to referral laboratories, costs for TCM examinations, costs for diagnostic examinations, costs for TB patient treatment packages, decentralization of drug-resistant TB patients to satellite health facilities and costs for transportation assistance for resistant TB patients drug. This fee is used for referral of sputum/non-sputum test samples, the cost of sending sputum from health facilities that do not yet have a TCM machine or Test Sample Collection Station (SPC) including prisons/remand centers to the designated TCM referral health facility or laboratory includes:

#### **Cost of delivery of test samples**

Courier or transportation costs from satellite health facilities or other health facilities including prisons/remand centers (non-TCM) to health facilities referred to by TCM examiners: real cost, reasonable or if there is no invoice/receipt, Rp. 25,000 per shipment by attaching a receipt.

#### **Cost of packing the test sample**

Packing services: Rp. 25,000 per patient or patient, with the calculation of these costs including the replacement of the material needed to pack the sputum

#### **Description of Aspects of inspection results reporting**

Reporting of inspection results illustrates that the TCM laboratory health facilities report monthly TCM report data for the current year period, monthly report data and SITB (Tuberculosis Information System) to the District/City Health Office. This sputum specimen is brought by a laboratory analyst or TB program holder at the puskesmas, the results of the TB specimen examination can be seen through the application system at SITB (TB information system) TB 05 which can be seen on sheet 05 below:

Figure 3. Documentation form TB 05

For health facilities that do not have a TCM machine or test sample collection station (SPC), they are facilitated with a fee to make a sputum referral where the courier or transportation costs from the satellite health facility or other health facilities to the referral health facility for TCM examination and the cost of sputum packaging. In order to increase the utilization of TCM examinations and increase access for TB laboratory examinations, monitoring and evaluation of TCM examinations and the transportation system that has been implemented both at the Provincial and District/City levels is necessary.

### Overview of Packaging Aspects and Referrals

Health facilities that do not have a TCM laboratory pack TB specimens to send specimen samples to the TCM laboratory health facilities. The packing procedure is that the patient visits to carry out an examination at the referral health center later the container is given to the patient to collect the sputum, then it is packaged by the laboratory analyst at the referral health center or the program holder and then taken to the TCM laboratory for examination.

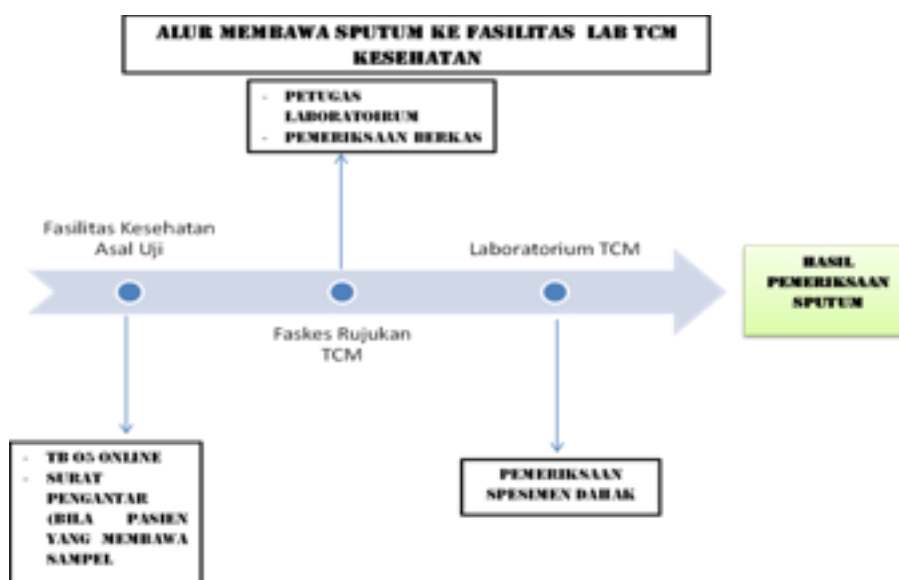


Figure 4. TCM Referral Mechanism

## Designing Model Based on SWOT

<p><b><u>Internal Strategic Factors</u></b></p>	<p><b><u>Strenght</u></b></p> <ol style="list-style-type: none"> <li>1. The existence of facilities and infrastructure as well as supporting facilities for TCM examination referrals</li> <li>2. Sources of financing to support the examination of cultures and <b>treatments by Global Found</b></li> <li>3. Accessibility of each puskesmas for TCM laboratory</li> <li>4. Human resources who have competence in specimen examination</li> <li>5. The quality of program holders continues to be improved through TOT TB</li> </ol>	<p><b><u>Weakness</u></b></p> <ol style="list-style-type: none"> <li>1. Still Lacking References to TCM examinations arranged by the City district Office in accordance with network arrangements</li> <li>2. Still lacking Provision of RO and satellite services</li> <li>3. Still high transfer <i>cases</i> in means that referral health centers have not handled their patients properly</li> <li>4. Case tracking system is still a passive system so CDR is still low</li> <li>5. Contact investigations of 22 health centers are still low and have not met coverage</li> <li>6. There is no SOP for TCM Examination by Each Puskesmas</li> </ol>
<p><b><u>External Strategy Factors</u></b></p>	<p><b><u>SO Strategy</u></b></p> <ol style="list-style-type: none"> <li>1. There is a TCM Lab in all Puskesmas</li> <li>2. Human resources, especially laboratory analysts in all puskesmas</li> </ol>	<p><b><u>WO Strategy</u></b></p> <ol style="list-style-type: none"> <li>1. Encouraging program holders to invest in contacts at puskesmas</li> <li>2. Active surveillance at the level</li> <li>3. TB TOSS movement needs to be improved</li> </ol>
<p><b><u>Threat</u></b></p> <ol style="list-style-type: none"> <li>1. Conducting a review of the inspection and referral system in the TCM club</li> <li>2. Analyze the low number of referral cases by the Referral Health Center</li> </ol>	<p><b><u>ST Strategy</u></b></p> <ol style="list-style-type: none"> <li>1. Conducting a review of the availability of TCM on the basis of improving the TB TOSS Movement</li> <li>2. Analyze the development of infrastructure and human resources to adjust the addition of TCM in each Puskesmas so that the network system becomes short</li> </ol>	<p><b><u>WT Strategy</u></b></p> <ol style="list-style-type: none"> <li>1. Encourage program holders to do a good job of packaging and referral systems</li> <li>2. Encouraging program holders to increase <i>detection rate</i> (new cases)</li> <li>3. MDR TB cases due to <i>dropouts</i> are controlled by each health center</li> <li>4. The role of officers in <i>preventive</i> efforts and <i>promotive</i> needs to be improved</li> <li>5. PMO is entrenched in suppressing droup out coronation sufferers</li> <li>6. Conduct training for managers TB and Pharmacy programs at all levels in terms of recording and reporting logistical data using</li> </ol>



		<p>SITB software</p> <ol style="list-style-type: none"> <li>7. Ensuring optimal access and utilization of TCM tools by establishing a specimen transportation system</li> <li>8. Facilitate the establishment of referral networks for the utilization of TCM.</li> <li>9. Ensure that all TCM tools in the district / city operate and function properly</li> </ol>
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The results of the 2013 prevalence survey conducted by the Directorate General of PP and PL in collaboration with the Research and Development Agency, it is known that the Prevalence rate of all forms of TB for all ages is 660 per 100,000 population, it is estimated that every year there are 1,000,000 people with TB cases in Indonesia. The coverage of TB case detection in Indonesia in 2014 was still low, namely 324,469 TB cases, or around 32% of the estimated TB cases. With the development of TB testing technology and taking into account the high prevalence and incidence of TB in Indonesia, it is one of the bases for implementing the diagnostic pathway for finding TB patients. TB examination using a rapid biomolecular-based test method (Molecular Rapid Test/ TCM TB) has been expanded not only for the detection of drug-resistant TB cases and TB in PLHIV, but also for the enforcement of new cases of TB in general. In addition, in accelerating the detection of TB cases, it is necessary to strengthen the specimen transport network and accelerate efforts to standardize TB treatment. The TCM TB Referral Laboratory at the Regency/City Level is a reference laboratory that is capable of conducting rapid test examinations, carrying out the function of technical guidance to TCM health facilities laboratories in their area (Indasah et al., 2020). According to Wau & Purba (2019) The TCM TB Referral Laboratory at the District/City level is determined by the Head of the District/City Health Office.

Management of Tuberculosis examinations in Ambon City using the TCM method with a network system determined by the head of the city health office (Zonneveld, 2010). Ambon City has 3 (three) TCM laboratories with a network system of 19 (nineteen referral health centers). laboratory personnel and thus support the use of this tool in the TCM laboratory health center. The operation of the tool as a diagnostic tool must meet the training requirements for TB program implementing staff for its use. 22 TB program holders have attended standardized TB training such as workshops and on the job training (OJT). specimens, the availability of personnel who are trained and skilled in operating TCM tools and able to solve problems related to TCM, but training in the use of this TCM tool must be carried out for health center analyst officers as accompanying staff for TB program holders and 22 health centers do not all have laboratory analysts, so the availability TCM is found in puskesmas that have laboratory analysis personnel, health facilities selected as TCM laboratories consist of management, TB poly doctors, TB/TB RO poly nurses, TCM laboratory coordinators, and TCM laboratory analyst officers. Related to the use of TCM as a diagnostic tool for pulmonary TB in 22 puskesmas in Ambon City, the number of suspected TB examinations examined with TCM did not meet the number of examination criteria, namely having to examine 200 specimens every month. In practice, GeneXpert's TCM is still prioritized for examination of drug-resistant TB cases, but along with the renewal of policy recommendations in Indonesia, TCM is not solely for RO-TB examination, but for all TB cases. In addition to specimen examinations, it must be increased by expanding examinations for all TB cases, some of the obstacles experienced in the implementation of P2TB, namely TB case detection is done by waiting for TB sufferers to come to the health center, case detection rate is still

low for close contacts in the field, awareness is still low the community about treatment and patient awareness of TB disease for treatment, other obstacles to patient follow-up that is not optimal and supervisors taking medication do not function optimally.

This is supported by several studies conducted in several countries around the world which show that TB testing with TCM GeneXpert has a higher sensitivity than microscopic examination, even though it uses a comparison/gold standard. One such study was conducted in Pakistan which compared two GeneXpert MTB/RIF assay and LED FM (LED-Fluorescence Microscopy) examinations using standard culture as the gold standard showing a sensitivity and specificity level of 74% and 100% respectively for GeneXpert MTB/RIF assay and 40% and 100% for LED FM (Khan et al, 2018). Another study showed that the sensitivity of TCM GeneXpert was around 86.9% and the sensitivity was 99.7% with a combination of culture and clinical diagnosis of TB as the gold standard (Tortoli et al, 2012).

The findings of this study also show that the low level of TB testing with TCM GeneXpert can be seen from the low referral rate for TB testing with TCM at the TCM laboratory health center, which comes from the referral health center, most of them have only drug-resistant TB, while the referral health center must continue to carry out contact tracing, but contact tracing which is low at referral health centers, it is undeniable that examinations using microscopy and sputum culture for TB examination also need to be carried out at referral health centers, TCM cannot be carried out alone but still uses conventional microscopic examinations as a comparison, but its utilization is a challenge in itself because the sophistication of this tool only takes a short time and results can be obtained on the same day. The exception is when the number of modules used is limited and unable to accommodate all specimens in one examination, it is necessary to carry out repeated examinations. Within 2 hours of the TCM examination, GeneXpert was not only able to detect TB that was resistant to the rifampicin type of drug, thereby increasing the accuracy of treatment in a short time.

The results of the above research are comparable to research conducted by Novianti et al. (2020) concerning the utilization of the GeneXpert Molecular Rapid Test (TCM) as a Diagnostic Tool for Pulmonary TB at Wangaya Hospital, Denpasar City that the low utilization of TCM GeneXpert in Hospitals is due to the lack of referral cases from FKTP or Puskesmas due to referrals Patients examined by TCM GeneXpert were limited to patients with 9 screening criteria (including those suspected of TBRO).

Case finding was carried out by TB program officers in 22 puskesmas in Ambon City, both actively and passively. Active case finding, namely finding TB cases from the investigation results of close family contacts with sufferers. The contact case finding step is carried out in the community by knocking on the door to every house, while passive case finding is that the program holder finds TB cases from close contacts who carry out checks at the health center. Handling of TB cases at the puskesmas starts with making a diagnosis through sputum examination for the referral puskesmas taking sputum then accompanied by the TB 05 formula then sent to the TCM laboratory if it is brought by the patient then accompanied by an assignment letter from the TB program holder, but if it is brought directly by the officer If the sputum test results are positive, then the TB program holder will provide OAT according to the category and type of TB disease he is suffering from. TB patients are required to take OAT regularly for 6 months of treatment and are directly supervised by the PMO (medicine supervisor) until treatment is finished.

The aspect of recording and reporting TB examination results (TB surveillance) is continuous systematic monitoring and analysis of data and information about TB incidence, obtained from 22 puskesmas or other data sources from other TCM service



centers. Based on the results of the research with the program holders, it is known that TB surveillance activities are carried out through SITB (tuberculosis information system) in which there is information about the patient's condition and TB case findings that come from examination reports, or TB suspected patients who check themselves directly at the puskesmas. The information system referred to in the Minister of Health of the Republic of Indonesia Number 67 of 2016, namely data for the TB control program is obtained from the TB recording and reporting system. The recording system was carried out at 22 puskesmas in Ambon city, carried out in 2 ways, namely offline and online, TB program holders recorded and reported TB patients in formula 05 TB patients, online, TB program holders recorded and reported to the Indonesian ministry using the SITT application (tuberculosis integrated information system), while recording and reporting to the Ambon City Health Office uses the SITB application so that the Ambon City Health Office can view the data at any time. Monitoring the progress of treatment of TB patients is carried out through the SITB system. This system contains patient identity information, patient family cell phone numbers, routine schedules for sputum examinations and OAT collection at the puskesmas. Based on the results of coordination research conducted between the Ambon City Health Office and the TB program holders at the puskesmas, namely monitoring and evaluating the P2TB program which is carried out once every 1 month simultaneously with supervision at all health centers as well as supervision of laboratory workers at the TCM Laboratory and monitoring external quality assurance laboratories, while for TB laboratory services.

The results of this study are supported by research conducted by Zarwita et al (2019) where the results showed that the evaluation carried out at the Balai Tuesday Health Center was optimal. However, there has never been an evaluation conducted by TB program holders at the Puskesmas on the performance of TB cadres. The coordination carried out was in the form of reporting TB cases by cadres to Puskesmas staff via WA communication. Monitoring and evaluation should not only be carried out for pulmonary TB management coordinators at the Puskesmas, but must also monitor other fields involved in the detection of pulmonary TB patients. This aims to see how far the implementation of the detection of pulmonary TB patients and what problems are hindering the program's achievements.

## **Conclusion**

Network system for TB specimen transportation system in Ambon City in 2022 3 health centers The TCM laboratory with a network system has 19 health centers. TB specimen referral mechanism at the Ambon City Health Office in 2022 will be carried out by 19 Referral Health Centers. Test samples from packaging and referral aspects at the Ambon City Health Office in 2022 will be carried out by 19 Community Health Centers as referral health centers for the process of sending specimens to the TCM Laboratory. Review and analyze aspects of reporting on examination results within the framework of the City of Ambon City Health Service in 2022 online using Form TB 05 from the TCM Laboratory Health Center to the Referral Health Center.

## **Suggestion**

Suggestion; (1) There needs to be an increase/addition of the TCM laboratory to shorten the network system, for referral health centers it is necessary to increase contact investigations and treatment monitoring so that treatment drop-outs become controlled; (2) Increase the capacity and network of TCM examinations to achieve universal access to drug sensitivity testing for new TB cases and TB re-treatment; (3) Rapid increase in diagnostic tests (sensitivity test second-line, first-line LPA and second-line LPA) and case finding supported by a strong mechanism for transporting sputum specimens, including from private health services; (4)

Strengthen the recording and reporting system to improve notifications; (5) Education for close contacts so that the scope of specimen examination can be increased, the mechanism for collecting specimens needs to be improved by taking sputum on the spot, which means that program holders carry out active case tracking surveillance; (6) Health workers need to increase socialization of the use of TCM to the community so that referrals for TCM examinations from other health facilities, especially from other hospitals and clinics/DPM increase.

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