www.irhsr.org

INTERNATIONAL REVIEW OF HUMANITIES AND SCIENTIFIC RESEARCH
By International Scientific Indexing
ISSN (Online) : 2519-5336

IMPLEMENTATION OF TB-DOTS IN RURAL HEALTH UNITS OF TARLAC CITY: AN ASSESSMENT

Ma. Susan Z. Maglaqui, Mary Jane N. Rigor, Lorna C. Gamis, Adora N. Obregon, Evelyn M. Labastilla, MSc Chem Ed., Alma M. Corpuz
Tarlac State University, Tarlac City, Philippines

Abstract

The study assessed the implementation of the TB-DOTS in ten RHUs in Tarlac City for 2015 and 2016. Record from the RHUs were obtained to gather data on the TB cases and the success rates. In addition, RHU personnel, volunteer health workers and patients were included as respondents of the study. The aims of the study were to (1) describe the TB-DOTS implementation in terms of the procedure and the number of the health personnel; (2) determine the new and relapse TB cases from the RHUs in 2015 and 2016; (2) assess the outcome of the new cases of TB-DOTS program in terms of the success rates in each of the RHUs; (3) identify the problems in the implementation of the TB-DOTS; and (4) propose intervention measures to improve the implementation of the TB-DOTS. Findings revealed that in 2015, all RHUs met the target success rates and in fact, succeeded the 90% goal set by the DOH. However, in 2016, two RHUs failed to meet the 90% target. Problems identified to have contributed to the low success rates in the two RHUs were the inability to locate the patients or they failed to go for treatment; deaths in the course of therapy and some were still undergoing therapy at the time of data collection. Recommendations to enhance the implementation of TB DOTS are presented in the study.

Keywords- *TB-DOTS, New cases, Relapse cases, success rate, failure rate*

INTRODUCTION

Tuberculosis (TB) is one of the top ten causes of mortality worldwide. It continues to be a global threat despite the programs being implemented to prevent its occurrence (Health Line, 2014). The World Health Organization (WHO) reported about 10.4 million cases of TB each year and 1.6 million deaths due to the disease. Ninety-five percent mortality occurs in low and middle-income countries, with India ranking 1st having the most number of mortalities followed by Indonesia, China, Philippines, Pakistan, Nigeria and South Africa (Centers for Disease Control and Prevention, 2017; WHO, 2017; Mohajan, 2015).

According to WHO (2010), One-third of TB cases worldwide is found in South-East Asian Region. In the Philippines alone, TB is reported to be the number one cause of morbidity. In fact, in 2016, 14,000 died and 4.8 million, mostly poor, got ill of the disease (Department of Health, 2017 & Diaz and Crisostomo, 2017).

Tuberculosis is caused by an airborne bacterium called *Mycobacterium tuberculosis*. It a communicable disease which is preventable and curable. However, what is troubling the health authorities worldwide is the occurrence of TB associated with Human Immunodeficiency Virus. More so, there is an increasing multidrug resistant tuberculosis (MDR-TB) cases worldwide. Drug-resistant TB originally developed because of the improper use of TB drugs. The deadlier TB strains are spreading from person to person, including those who have not contracted the disease before (Health Line, 2014).

In response to this global catastrophe, the WHO TB program declared a global emergency in 1993 for TB and began implementing a treatment program called the Directly Observed Short Course (DOTS), which is an internationally recommended management strategy in controlling tuberculosis because it is recognized to be highly efficient and cost-effective (Out, 2013; WHO, 2017).

DOTS for TB consists of diagnosing cases, treating patients for 6-8 months with drugs and promoting adherence to the relatively difficult treatment prescriptions. Health workers need to conduct regular sputum tests on patients and they can be declared cured if two consecutive sputum Acid Fast tests are negative. The two main purposes of DOTS are to ensure that patients complete the prescribed duration of treatment and prevent drug resistant cases from developing in the community (Davies, 2003; Moise and De Groot, 2009).

In 2009, the National Center for Disease Prevention and Control of the Department of Health (DOH), spearheaded the formulation of the 2010-2016 Philippine Plan Action to control TB (PhilPACT). One of the aims was to scale up and sustain coverage of implementation of DOTS (DOH, 2014). To attain the aims, two of the important strategies are to localize implementation of TB control and to monitor health system performance.

In 2000, data showed that DOTS was implemented globally with a reported success rate of 88% and its case detection was 48%. The WHO claimed that the program has met the global targets of 75% case detection and 87% success rate. However, a concern was raised whether the outcome could be sustained and if uncontrolled MDR-TB would pose a global health threat (Romualdez, 2007).

In a report, there were 450,000 who developed MDR-TB in the Philippines and about 9.6 percent had extensively drug resistant TB (XRD-TB). Out of these cases, 170,000 died of the disease (The Manila Times, 2014). In Central Luzon, there were 14,846 TB cases. Of these, 11% completed the treatment, 77% were cured, four percent defaulted and three percent died.

The present study therefore was conducted in order to monitor the outcome of the implementation of TB DOTS in the 10 rural health centers in Tarlac City. The aim is to propose measures that would enhance the implementation of TB DOTS in order to achieve a TB free Tarlac City.

LITERATURE REVIEW

Directly Observed Short Course (DOTS) to treat TB worldwide began in 1993 and continues to the present time. It remains as the best management strategy to curb prevalence of TB (Moise and De Groot, 2009; Tulchinsky and Varakivoka, 2014 & WHO, 2017).

The program, DOTS, consists of five elements-(1) political commitment with increased and sustained financing; case detection through quality- assured bacteriology; standardized treatment, with supervision and patient support; effective drug supply; and monitoring/ evaluation system, and impact measurement (WHO, 2017, 2010; DOH, 2016 & Lee, 2012).

The DOTS is adopted worldwide sine it is believed to the most effective strategy against TB. In a retrospective study of Ejeta et. al. (2014), the outcome of a five-year (2009-2013) TB DOTS implementation in Ethiopia was assessed. There were 1175 tuberculosis patients involved in the study. Findings revealed that 14.5% were cured, 56.3% completed 0.2% treatment failed, 8.1% died, 7.1% defaulters, and 13.2% were transferred to other health facilities. The cure rate was 70.8%.

Similarly, an outcome assessment of DOTS was conducted in Nigeria in 2014 by Sunday et.al. (20140. The success rate was reported to be high (85.45%) compared to the national percentage. However, 9.52% died and 0.98% defaulted, which were considered serious public concern needing urgent solution.

Moreover, Motghare , Sardessai. Caz and Kulkarni (2014) assessed the tuberculosis treatment outcomes using the DOTS in Goa. Cure rate was 42.9%; 42.3% completed treatment; 4.9% were defaulters; 2.7% patients died; 1.6% failure rates; and 0.5% shifted to other non-DOTS treatment facilities.

Furthermore, outcomes assessment of TB DOTS implementation was also conducted in India, being the highest ranked country with TB cases. The study covered 2013 and 2014 TB patients. Out of 1340 registered cases, cure rate was recorded at 90.29%; defaulter rate, death rate, treatment failure and transferred out cases were 2.31%, 4.10%, 1.49%, and 1.79% respectively (Piparva, 2015).

However, despite the recorded significant improvement in TB detection and treatment via the DOTS implementation, challenges surfaced that is believed to detract occurrence of defaults and deaths. The study of Bello (2010), for example, found the side effects of drug intake against TB among patients in Nigeria which included dark urine, nausea and vomiting, and some with

yellowish eyes. More importantly, is the incapability of patients to shoulder the cost of TB drugs in cases when public health centers ran out of stocks.

More challenges in the implementation of DOTS were revealed in the study of Rajagopaul, Reddy & Kistnasamay (2014) in South Africa. The challenges included accountability, inadequate systems for follow-up and tracing of defaulters, limited training of DOTS supporters and the choice of DOTS supporters and sites. Moreover, nurses in the centers were inadequate, which had adversely affected record keeping. To augment the lack of nurses, volunteer DOTS supporters were recruited. However, if the supporters found jobs, they abandoned patients assigned to them without informing the health facility.

Problems were likewise encountered by health personnel in the Philippines. Reyes and Amores (2014) stated that while a significant drop in mortality and morbidity due to TB is achieved, it still remained a major health problem in the Philippines. Accordingly, the rate of decrease in morbidity and mortality is not fast enough. In their study, they found that socio-cultural, financial and health system factors are barriers to a more effective TB management in the country.

More problems in the DOTS implementation surfaced as revealed in the 5th eHealth Online Discussion (2013). Some of which were the incidence of patients testing negative in sputum smear tests in health centers despite being declared positive in a hospital; TB drugs for children were not prioritized in centers; patients who are working or studying had difficulties getting assistance to medications. These are potential causes of defaults or inability to substantially lower down TB cases in the Philippines.

The challenges and barriers in the implementation of DOTS need to be addressed in order to acquire a TB free Philippines. Thus, all sectors of the government must work together to find ways in the effective and efficient implementation of DOTS. Studies such as this, would help the government implementing agency in gathering significant information in reviewing statutory policies, guidelines and strategies relative to TB eradication.

OBJECTIVES

General Objective:

To assess the outcome of TB -DOTS implementation in the Rural Health Units (RHUs) in Tarlac City for 2015 and 2016.

Specific Objectives:

1) To describe how TB-DOTS is implemented in the rural health units in Tarlac City in terms of:
   a) Procedure for TB-DOTS implementation
   b) Number of health workers assigned for TB-DOTS
2) Determine the status of the TB patients in the RHUs of Tarlac City in 2015 and 2016 in terms of:
   a) New cases and
   b) Relapse cases
3) To assess the outcome of the new cases of the TB-DOTS implementation in 2015 to 2016 in terms of:
   a) Success rates and

b) Failure rates
4) Identify the problems in the implementation of the TB-DOTS
5) To propose intervention measures to improve the implementation of the TB -DOTS in RHUs.

METHODOLOGY

Design. This study used descriptive design in determining the outcome of TB-DOTS implementation in ten RHUs in Tarlac City.

Locale. The study was conducted in the 10 RHUs in Tarlac City. TB records were obtained from these RHUs and two hundred patients were taken as respondents from the health units.

Respondents. In identifying the problems encountered in the implementation of TB-DOTS, 100 health personnel out of 868 health personnel and BHWs and 100 patients were included as respondents to provide the data. Quota sampling technique was employed in selecting the respondents.

Instrument. A questionnaire was developed to gather data from the respondents. It underwent dry run among 20 TB patients who were not included as respondents of study. The reliability index was 0.88 via Cronbach Alpha, indicative of a reliable instrument.
In addition, records were requested from the RHUs to obtain information on new and relapse cases, success and failure rates. The nurse assigned to coordinate the TB -DOTS implementation, including the City Health Officer were interviewed to gather data on the procedure in implementing the TB-DOTS.

Procedure. Research enumerators fielded the questionnaires to the selected RHUs. Questionnaires were retrieved on the same day. Records were requested from health centers and the researchers also approached the City Health Officer for an interview on the procedure of the TB-DOTS implementation.

Statistics. The frequency count and percentage were used to present the new and relapse cases, success and failure rates and the problems in the implementation of the TB-DOTS.

Research Ethics. Letter to the City Health Officer was submitted asking for permission to conduct the study. Informed consent was attached in the questionnaires for the health personnel, volunteers and patients. The purpose of the data gathered from them was explained well to the respondents. They were assured of the confidentiality of their identity in the presentation of results.

RESULTS AND DISCUSSIONS

The implementation of TB-DOTS

The implementation of TB -DOTS in the 10 RHUs of Tarlac City is described in this study based on the procedure involved and the number of health personnel assigned to implement the TB-DOTS

Procedure of the implementation of the TB-DOTS

The TB-DOTS program includes the following steps in the treatment of patients.

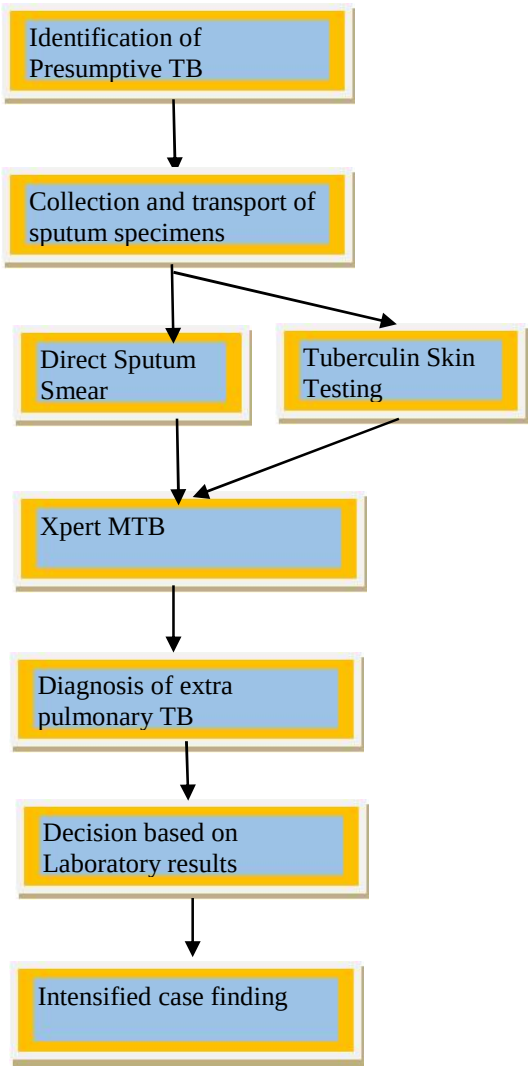

Figure. 1 Procedure for TB-DOTS

TB-DOTS program starts with identification of presumptive TB cases. The health personnel checks for clinical signs and symptoms. For patients who are 15 years old and above, a presumptive TB consists of cough for at least 2 weeks duration with or without significant and unintentional weight loss; fever; bloody sputum (hemoptysis); chest/ backpains without any diagnoses; musculoskeletal pain; easily fatigued; night sweats; and shortness of breath or difficulty in breathing. There is also unexplained cough of any duration. For patients below 15 years old, at least three of the following: (1) coughing and wheezing of 2 weeks or more; (2) unexplained fever; (3) loss of weight/ failure to gain weight; (4) failure to respond in 2 weeks to lower respiratory antibiotics: (5) failure to regain previous state of health in 2 weeks; and (6) fatigue, lethargy and reduced playfulness. Chest x-ray findings are positive with or without symptoms. Presumptive TB which has the following symptoms (1) neck stiffness, (2) pleural effusion, pericardial effusion, (3) distended abdomen, (4) non-painful enlarged joint, (5) signs of tuberculin hypersensitivity (DOH Regional Office 3, 2016).

After the identification of presumptive TB, the medical technologists collect and transport the specimen from the center to the laboratory. The medical technologist performs a Direct Sputum Smear Microscopy (DSSM). Two sputum smears are required within a span of 3 days. There are also rapid tests available. Tuberculin Skin Test is also being performed but is only used as screening test for children. If at least one sputum smear is positive, the patient is declared positive for TB (https://www.philhealth.gov.ph).

An important procedure after testing positive for DSSM is Xpert MTB. This procedure will determine whether the patient is resistant to anti-TB drugs.

For patients less than 15 years old, a tuberculin skin test is performed. A positive result is an area of induration of the skin with 10 mm diameter (DOH Regional 3 Manual, 2016).
For extrapulmonary TB, the physician can perform clinical diagnosis. The clinical diagnosis can be verified through analysis of CSF via Xpert- MTB.

If patients test positive for clinical or bacteriological tests, the patient is now registered for treatment. The health workers will perform series of interview and monitoring of the patient, including the household of the patient for possible familial contamination. Treatment of TB - DOTS is from 6-8 months. The physician determines the drugs to be administered and the dosages. **1.2. Number of Health Personnel Assigned in the TB-DOTS implementation**
The researchers, requested for the record of the TB-DOTS personnel.

Table 1. Personnel Assigned in the TB -DOTS implementation in 10 RHUs

Health Profession	f	%
Physician	11	1.27
Nurses	26	3.0
Medical Technologists	5	0.57
Midwife	37	4.26
Barangay Health Workers	789	90.90
Total	868	100%

Table 1 shows the health personnel assigned to implement TB-DOTS in the 10 RHUs in Tarlac City. It could be seen that most of the health workers (90.90%)) are volunteers from the barangay who are provided with an allowance from PhP 500 to PhP 1000. The BHWs are trained by the midwives to interview residents in the community and weighing, These are the initial steps undertaken by the health personnel in order to establish presumptive TB. BHWs are not trained for laboratory diagnosis. Only medical technologists are trained It could be observed that there are only five or 0.57% medical technologists servicing the 10 RHUs. Considering that the diagnosis of TB relies mostly on laboratory procedures, inadequacy of medical technologists poses a problem in the efficient and effective identification of TB patients. This was affirmed by the medical technologists, nurses and City Health Officer interviewed by the researchers. According to the nurses, sometimes patients come to the center for sputum examination but the medical technologists assigned to a particular center could not come since they have patients in the other health center. According to the City Health Officer, this affects the accuracy of monitoring the

status of the TB patients. If patients are rescheduled, they no longer report to the RHU because of their previous experience.

Nurses comprised 3% of the TB-DOTS personnel. Considering the number of patients coming for TB diagnosis and treatment, this number is inadequate since aside from TB-DOTS, they need to provide other health services such as maternal and child health care and others.
Midwives are also inadequate (4.26%). Considering the large number of BHWs to be trained in the presumptive identification of the TB patients, 37 midwives are not enough for the provision of thorough training.

There are 11 physicians assigned in 10 RHUs of Tarlac City. One is the City Health Officer assigned as the over-all chair of the TB-DOTS implementation. On the other hand, a nurse assigned at the RHU 10 is the coordinator of the TB-DOTS who consolidate records from the 10 RHUs.

Generally, findings on the number of professional personnel assigned in the TB-DOTs implementation is inadequate. There are numerous BHWs but their involvement in the identification and monitoring of the progress of TB treatment is limited since they do not have the technical skills for clinical and laboratory diagnosis.

Cases of TB in Tarlac City
New and relapse TB cases for 2015 and 2016 were obtained from the RHUs.

New Cases
New Cases of TB refers to the cases of TB for the first time in the community.

Table 2. New TB Cases for 2015 and 2016

RHU	2015	2016
1	123	129
2	135	138
3	89	94
4	64	70
5	80	79
6	69	72
7	83	88
8	66	78
9	76	72
10	79	82
Total	864	902

Table 2 shows the number of new cases of TB in 2015 and 2016. As seen, there were 864 new cases in 2015 and 902 in 2016 in all 10 RHUs. Moreover, an increase in new cases can be observed from 2015 to 2016, except in RHU 5 and 9. This is attributed to the effective monitoring the household of the TB patients. They were told to be careful in isolating their belongings and themselves during the infective stage of the TB illness. The findings of the study on the increased new cases of TB from 2015 to 2016 ran counter to the report in the United States. The Center for Disease Control and Prevention (2016) reported a 2.9% decrease in 2016 compared to 2015. But is similar to India, reported to have the highest TB in 2016 in the whole world (Wire, 2016).

Relapse Cases

Relapse cases are those patients who were treated but had recurred.

Table 3. Relapse TB Cases for 2015 and 2016

RHU	2015	2016
1	17	23
2	14	28
3	3	8
4	8	17
5	2	3
6	4	6
7	18	23
8	6	14
9	2	8
10	27	18
Total	101	148

Table 3 shows that relapse TB cases in 2015 to 2016. An increase from 2015 could be observed. Some of the patients stopped taking anti-TB drugs or took them regularly. According to the health workers, closed supervision on these cases were done but the patients were not able to comply with the treatment on time. The finding is similar with India which was reported to have 10% relapse cases in 2016 (Azhar, 2016).

Outcomes of the treatment of New Cases

The outcomes of the study are measured in this study in terms of the success and failure rates. The findings are presented in Table 4 and 5.

Success Rates

Table 4. Success Rates for the New Cases

RHU	2015 (%)	2016 (%)
1	100	93
2	**93**	**87**
3	100	100
4	100	100
5	96	98
6	99	96
7	100	77
8	100	100
9	99	100
10	98	99

For the success rates of the treatment of the new cases, it could be observed that all RHUs exceeded the goal of the DOH of 90% in 2015 but two RHUs failed to reach the goal, particularly in RHU 2 and RHU 7. According to the nurses assigned in these RHUs, patients were lost in follow-up. Some patients failed to comply with the required 6-8 months treatment. The success rates in the 10 RHUs in Tarlac City were higher than in India having 86% (TB Facts. Org., 2016).

Failure Rates

Failure rates refer to the failure in treating the new cases of TB Dots.

Table 5. Failure Rates

RHU	2015 (%)	2016 (%)
1	0	7
2	7	13
3	0	0
4	0	0
5	4	2
6	1	4
7	0	23
8	0	0
9	1	0
10	2	1

It could be seen in Table 5 that the failure rates for 2016 were high than in 2015. This is attributed to the patients' inability to follow the prescribed schedule and dosages of the anti-Tb drugs.

Problems in the Implementation of the TB-DOTS

Patients

Table 6. Problems of the Patients in the TB -DOTS Implementation

N=100

Problem	f	%
Lack of personnel to perform DSSM	71	71
Very long queue in the health center	65	65
Fear of stigma	45	45
Fear of side effects of anti-TB drugs	34	34
Loss of appetite in eating	33	33
No family member to accompany them to health center.	23	23
Failure to take the medicines on schedule	25	25

The problems of the patients in the TB-DOTS treatment is mostly the lack of heath personnel , especially of medical technologists who will perform the laboratory diagnosis (71%). According to the patients, they get frustrated when they go to the center only to find out that the laboratory personnel is not around. According to them, it is a waste of time to go to the center, considering that patients were mostly males who had to work for their food.

Some also claimed that there is a long queue in health center since there are also patients other than those availing of the TB-DOTS (65%). Others had a fear of the stigma of TB once others find out they are positive of the disease (45%). Some fear of the side effects of taking the anti-TB drugs such as nausea, vomiting and stomach ache (34%).

Come claimed they loose appetite (33%) when taking the anti-bacterial drugs and they do not have someone to accompany them to the center (23%).

The findings on the problems of the patients in undergoing the TB-DOTS is consistent with what Web MD (2017) that taking anti-TB drugs may cause hives, loose of appetite, nausea, vomiting, skin rash, jaundice, and blurred vision.

Health Personnel and Barangay Health Workers

The health personnel and the BHWs were asked the challenges they encountered in the implementation of the TB-DOTS. Data are shown in Table 7.

Table 7. Problems of Health Personnel and Volunteers
N=100

Problem	f	%
Lack of personnel to do the DSSM	66	66
Some patients do not come back on their schedule.	65	65
Some patients do not come during laboratory diagnosis	64	64
Inadequate training of the BHWs	78	78
Ineffective system of monitoring TB-DOTS enrollees.	56	56

The problems of the personnel in the implementation of the TB-DOTS were consistent with the problems expressed by the patients. These were lack of training of the BHWs (78%); lack of personnel to the DSSM (66%); some patients did not come back on their schedule (65%) ; and some patients did not coma during their laboratory diagnosis (64%).

The findings on the problem of the personnel in implementing the TB-DOTS were consistent with the findings of Rajagopaul and Kistnasamy (2014) in South Africa that lack of training of supporters (equivalent to BHWs in the Philippines) and lack of system of monitoring or tracing TB patients is a challenge in the TB-DOTS Implementation.

Proposed Intervention Measures

Based on the problems identified in the implementation of TB-DOTS, the following intervention measures are proposed.

Problem	Action	Expected Outcome
Lack of personnel to perform DSSM	City government must increase the number of medical technologists to be deployed to the RHUs. At present, one MT is assigned to 2 RHUs. Considering the number of patients, 1:2 ratio	Additional 5 MTs will address the lack of personnel to perform laboratory diagnosis.

	will hardly accomplish two sputum analyses for all TB patients	
Very long queue in the health center	Systematic scheduling of patients. Create a separate line for TB patients.	Long queues are avoided
Fear of stigma	Massive information-dissemination to the public that TB is curable and not infective once treatment has started.	Renewed perception about having TB
Fear of side effects of anti-TB drugs	Nausea and Vomiting- eat small frequent meals; eat cooled food at room temperature; eat dry salty biscuits; eat light, low fat food; no lying down immediately after eating. Constipation – add fiber like whole grains, bran and dried fruit; consume a lot of liquid; exercise regularly. Diarrhea- prevent dehydration, replenish sodium; avoid fried foods; limit sugar; avoid alcohol and caffeine	Side Effects of taking TB-drugs are avoided
Loss of appetite in eating	Eat 5 to 6 smaller meals; Reduce or cut down on low energy- and nutrient dense foods/beverages.	Appetite will not be affected when taking anti-TB drugs
No family member to accompany them to health center.	BHWs must include education to household on the importance of accompanying their sick family member	Family members become involved in the treatment of the TB patients.
Lack of training of BHWs	Conduct a more frequent and regular training for BHWs	BHWs are adequately trained in visiting TB patients and reminding them of the need to regularly visit the health center

Conclusions

TB -DOTS implementation follows a procedure that starts from identification of presumptive patients; validation of presumptive patients through laboratory tests and finally, the treatment of TB for 6- 8 months.

1) TB-DOTS implementation for 2015 and 2016 in the 10 RHUs in Tarlac City is considered effective because of the success rates above the 90% target except for two RHUs which registered below 90% success rates in 2016.
2) Problems in the implementation of TB-DOTS included inadequate health personnel assigned in the implementation of TB-DOTS, especially the medical technologists; lack of system to

trace all patients in order to ensure that they get the treatment for the prescribed number of months; failure of the patients to show up regularly during their scheduled health center visit; inadequate health personnel; fear of stigma; and fear of side effects of dugs.

Recommendations

1) The City government must open items for additional health personnel, especially for medical technologists, in order to achieve success of TB-DOTS. Medical technologists are needed to monitor progress of medications through laboratory tests.
2) RHUs must collaborate with the barangay leaders in locating the permanent addresses of the patients in order to track them anytime they are needed. This will reduce lost to follow-up patients.
3) RHUs must keep record of mobile numbers, not only of the patients, but their family member. In this way, they could contact patients or their relatives to be reminded of their treatment schedules.
4) Health education from health personnel must emphasize that once TB patients are taking medications for weeks, they are no longer contagious. This will reduce the stigma that hinders patients to regularly visit the health center for their complete healing.
5) The intervention measures proposed in this study may be implemented in the RHUs.
6) A repeat study must be conducted to monitor progress of TB-DOTS for the coming year.
7) Another study should be conducted in a province-wide scope.

References:

Azhar, G. (2016). *DOTS for TB Relapse in India: A Systematic Approach*. Retrieved Nov. 22, 2017 from https://www.ncbi.nlm.nih.gov.

Bello, S. I. (18 March 2010). *Challenges of DOTS implementation Strategy in the treatment of tuberculosis in a tertiary health institution, Ilorin, Nigeria.* Retrieved Nov. 14, 2017from http://www.academicjournals.org/article/article1380808533_Bello.pdf

Centers for Disease Control and Prevention (November 9, 2017). *CDCs Role in Global TB Control*. Retrieved November 16, 2017from https://www.cdc.gov/globalhivtb/who-we-are/about-us/globaltb/globaltb.html

CDC (2016). *Key Findings. The rate of decline in the United States remains too slow to achieve TB elimination in this century*. Retrieved from Nov. 23, 2017 from https://www.cdc.gov/tb/publications/factsheets/statistics/tbtrends.htm

Davis, P.D. (2003).*The role of DOTS in tuberculosis treatment and control*. Retrieved Nov. 13, 2017 from https://www.ncbi.nlm.nih.gov.

Department of Health (2017). *Leading Causes of Morbidity*. Retrieved Nov. 12, 2017 from http://www.doh.gov.ph.

DOH (2016). *National Tuberculosis Control Program Laboratory Network Strategic Plan*. Retrieved Nov. 14, 2017 from http://www.doh.gov.ph/

DOH (31 July 2014). *National Tuberculosis Program.* Retrieved Nov. 14, 2017 from http://www.healthpromo.doh.gov.ph/nation l-tuberculosis-control-program/

DOH Regional Office 3 (2016). *Training on the Revised NTP Manual of Procedures,* 5th ed.

Diaz, J. and Crisostomo, S. (27 March 2017). *TB Still a Major Cause of Death Among Filipinos.* Retrieved Nov. 12, 2017 from https://www.pressreader.com

Eyasu Ejeta, E. , Chala, M., Arega, G., Ayalsew, K., Tesfaye, L, Birhanu, T. and Disassa, H. (7 April 2015). *Treatment Outcome of Tuberculosis Patients under Directly Observed Treatment of Short Course in Nekemte Town, Western Ethiopia: Retrospective Cohort Study*. Retrieved Nov. 15, 2017 from https://www.omicsonline.org

5th eHealth Online Discussion (25 March 2013). Topic: *TB DOTS Clinic*. Retrieved Nov.17, 2017 from http://www.ehealth.ph/index.pph.

Health Line (23 March 2014). *Tuberculosis is Fast Becoming a Global Threat*. Retrieved Nov. 12, 2017 from https://www.healthline.com/health news/tuberculosis-spreading-worldwide 032314

Lee, J. (2012). *The 5 Elements of DOTS*. Retrieved Nov. 14, 2017 from http://www.personal.psu.edu

Moise, L. and De Groot, A. (2009). *Mycobacterium tuberculosis.* Retrieved Nov. 13, 2017 from http://www.sciencedirect.com/

Mojan, H. (6 February 2015). *Tuberculosis is a Fata Disease Among Some Developing Countries of the World.* Retrieved November 11, 2017 from Science and Education Publishing at http://pubs.sciepub.com/ajidm/3/1/4/

Motghare , D., Sardessai. G., Caz, F., and Kulkarni,M. (2014). *Study of treatment outcomes in tuberculosis patients on DOTS therapy at five centres in Goa*. Retrieved Nov. 16, 2017 from http://www.scopemed.org/?mno=1357

Out, A. (3 June 2013). *Is the directly observed therapy short course (DOTS) an effective strategy for tuberculosis control in a developing country?* Retrieved Nov. 13, 2015 from https://www.ncbi.nlm.nih.gov.

Piparva, K. (2015). *Treatment Outcome of Tuberculosis Patients on DOTS Therapy for CAT 1 and 2 District Tuberculosis Centre*. Retrieved Nov. 15, 2017 from http://ijpsr.com

Rajagopaul, A., Reddy, P. & Kistnasamay, E. (2014). *Challenges of Directly Observed Treatment Strategy Implementation in eThekwini Municipality, South Africa.* Retrieved Nov. 15, 2017 from https://www.researchgate.net

Reyes, K. & Amores, J. (March 2014*). Barriers of Early TB Diagnosis among the Poor in Highly Urbanized Areas in the Philippines.* Retrieved Nov. 15, 2017 from https://dirp3.pids.gov.ph/webportal/CDN/P BLICATIONS/pidsdps1418.pdf

Romualdez, A. (May 2007). *TB-DOTS in the Philippines: impact of decentralization and health sector reform.* Retrieved Nov. 14, 2017 from http://www.who.int/bulletin/volumes/85/5/ 6-036285/en/

Sunday,O., Oladimeji, O., Ebenezer, F., Akintunde,B., Abiola, T., Saliu, A., and Abiodun. O. (28 Sept. 2014). *Treatment Outcome of Tuberculosis Patients Registered at DOTS Centre in Ogbomoso, Southwestern Nigeria: A 4-Year Retrospective Study*. Retrieved Nov. 15, 2017 from https://www.hindawi.com.

The Manila Times (2014). *Drug-Resistant TB: A Growing Problem*. Retrieved Nov. 14, 2017 from http://www.manilatimes.net

Tulchinsky, T. and Varakivoka, E. (2014). *Communicable Diseases*. Retrieved Nov, 15 2017 from http://www.sciencedirect.com

Web MD (2017). *Multiple Drug Therapy for Tuberculosis.* https://www.webmd.com.

Wire (2016). *India Has Highest Number of New TB Cases Reported in 2016, Says WHO.* https://thewire.in

World Health Organization (2017). *What is DOTS (Directly Observed Short Course)?* Retrieved March 3, 2-17 from http://www.searo.who.int.

World Health Organization (2010). *Tuberculosis in the WHO-South East Asian Region.* Retrieved Nov. 14, 2-017 from http://www.who.int.