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A Comprehensive Care Management Program to Prevent Pulmonary Tuberculosis Disease Through Improving Residential Sanitation in Surabaya, Indonesia

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ABSTRACT The risk of transmitting pulmonary tuberculosis in the family needs to be a concern, especially for toddlers and the elderly who have a lower immune system—as well as for people with HIV who have damaged the body's immune system. In preventing the transmission of pulmonary tuberculosis, the role of the family is very important, because one of the duties of the family is to provide care for family members who are sick and to prevent transmission to healthy family members through measures that must be implemented in their daily lives. Efforts to prevent disease transmission, especially TB, which can be done are to improve the conditions of houses and sanitation facilities to support the realization of a healthy house. A healthy house is a house with physical facilities that meet the requirements for the health of its occupants, such as the fulfillment of ventilation, lighting, humidity, and occupancy density; all of which must meet health requirements so that it does not become a medium for disease transmission. This community service activity aims to create healthy settlements to prevent the transmission of pulmonary TB disease in the working area of the Pegirian Community Health Center, Surabaya in 2020. The target of this activity was specifically aimed at people with pulmonary tuberculosis in the working area of the Pegirian Community Health Center, Surabaya. The approach was carried out by the methods of observation, interviews, counseling, demonstrations of proper handwashing, and motivating residents to create a healthy house and environment by giving assistance in the form of glass tiles and handwashing with soap souvenirs.

INDEX TERMS Prevention of pulmonary tuberculosis, house sanitation

I. INTRODUCTION

The house is an arrangement of residential spaces that are closed or separated from the influence of the outside environment, the house must be able to keep its occupants away from health problems caused by epidemics of infectious diseases, for example, dengue fever, tuberculosis, cholera and dysentery (Healthy House Plan, 2009) [1]. The requirements for a healthy house are to meet physiological needs, including the fulfillment of ventilation, lighting, noise canceling and adequate children's play areas; as well as to meet psychological needs, including being quite safe and comfortable for each occupant, the sitting room can be used as a family dining

room and so on[2]. Furthermore, a healthy house should also be able to prevent disease transmission, including provision of water; free of insects and rats; the availability of garbage disposal, waste water disposal, excrete disposal and; free food and beverage contamination. And, another requirement for a healthy house is to be able to prevent accidents (Didik Sarudji, 2012). A healthy house should be able to prevent disease transmission. This means that the physical facilities of the house, such as ventilation, lighting, humidity and occupancy density must meet health requirements so that it does not become a medium for disease transmission, especially environmental-based infectious diseases. House sanitation conditions are sought to reduce the transmission of infectious diseases or other health problems, especially pulmonary TB.

Tuberculosis spreads through the air in the form of droplets of phlegm when coughing or sneezing. According to Mandal et al (2004: 220), Tuberculosis is the most common infectious disease in the world, with an estimated one-third of the population infected with tuberculosis and 2.5 million people dying every year[3]. Pulmonary TB disease can attack all age groups and genders and has begun to spread not only to low socioeconomic groups. Data from all around the world show that morbidity and mortality increase with age. According to the Ministry of Health of the Republic of Indonesia (2008: 3), it is estimated that globally, pulmonary TB in the world occurs in developing countries, and deaths due to pulmonary TB in women are more than deaths due to pregnancy, childbirth, and the puerperium[2].

Data on patients with pulmonary TB in 2013 showed that Surabaya ranked second in East Java after Jember. The 3 highest ranks of regions with patients with pulmonary TB in the last 3 months (January, February, and March 2013) in Surabaya were Perak Timur (94), Dupak (75), and Pegirian (45) (Surabaya Health Office, 2013) and 70 in 2014. Residents of Surabaya, East Java, are susceptible to Mycobacterium tuberculosis bacteria (TBC). At least 4,493 residents of Surabaya are infected with Mycobacterium tuberculosis bacteria[4].

This is in accordance with the competence of the academic community of the Department of the environmental health of Surabaya, which carries out the Tri Dharma College program of activities in the form of community service. Various studies' results that support these activities are the implementation of a study conducted by Lecturers of the Department of the Environmental Health of Surabaya in 2017 (Rachmaniyah, Umi Rahayu, Imam Thohari) entitled: "The Role of Red Guava Extract (Psidium Guajava L.) as Antioxidant against the Protection of Lung and Kidney Organs in Mice Exposed to Cigarette Smoke." Also, a study in 2015 entitled: "The Relationship of Air Quality and House Sanitation with the Incidence of Pulmonary Tuberculosis in the working area of the Pegirian Community Health Center." The implementation of the two studies is very suitable to be applied in the intended community service activity.

The study results by Umi Rahayu et al, 2015, regarding the relationship of air quality and house sanitation with the incidence of pulmonary tuberculosis in the working area of the Pegirian Community Health Center, 2015 showed that: 1) The bacteriological quality of the air in the houses with pulmonary TB patients mostly did not meet the bacteriological quality requirements of air of a healthy house. 2) Sanitation of houses with pulmonary TB patients: a) Ventilation: Most of the ventilation in the houses with pulmonary TB patients did not [5]meet the house health requirements, only some of which meet the house health requirements. b) Lighting: Most of the lighting in the houses with pulmonary TB patients did not meet the house health requirements, only some of which meet the house health requirements c) Humidity: Most of the humidity in the houses with pulmonary TB patients did not meet the house health requirements, only some of which meet the house health requirements. d) Temperature: Most of the temperatures in the houses with pulmonary TB patients did not meet the house health requirements, only some of which meet the house health requirements. e) Occupancy Density: Most of the density in the houses with pulmonary TB patients was good (not dense) or met the house health requirements, only a few were not good (dense) or did not meet the house health requirements. Based on the results of a settlement environmental survey conducted in the working area of the Pegirian Community Health Center, the majority of the population is the Madurese with a low level of knowledge about health promotion efforts so the TB disease data in the area is very high. Based on the results of a survey of the residential environment conducted in the working area of Puskesmas Pegirian, the majority of the population is Madurese and with a low level of knowledge about health promotion efforts, the TB disease data in the area is very high. The working area of the Pegirian Community Health Center includes Semampir Sub-district with a total of 5 villages, with a population of 155,741 people. It is hoped that the community service activities in the form of counseling efforts and precarious glass interventions in patients, can reduce the transmission rate of pulmonary TB cases in the Pegirian Puskesmas area.

Community empowerment efforts (cadres and community leaders) are active and ready to work together to improve settlement sanitation in the Pegirian Health Centre working area. This effort is expected to create conditions that lead to the realisation of healthy homes in accordance with Kepmenkes No. 829 of 1999 that are clean and healthy that provide comfort, peace and health for residents and the community. Efforts to empower the community (cadres and community leaders) who are active and ready to work together to improve settlement sanitation in the working area of the Pegirian Community Health Center need to be taken. These efforts are expected to create conditions that lead to the realization of a healthy house in accordance with Kepmenkes No. 829 of 1999 which is clean and healthy and able to provide comfort, peace and health for its occupants and the community.

The number of new cases of pulmonary TB disease at the Pegirian Community Health Center in 2018 was 150 people. The cure rate for AFB+ in 2018 is 65% while the success rate of treatment in Surabaya in 2018 was 75.35%. When compared with the previous year, it showed an increase in the success rate of treatment of 4.15%[6]. The community, patients and families of patients are willing to be healthy so they welcome enthusiastically to this community service activity of lecturers of Poltekkes Surabaya. The impact of COVID-19 control affects all aspects of community life, especially patients and families, thus they hope for stimulant assistance from this community service activity. Based on background described, it is necessary to carry out community service activity entitled "Pulmonary Disease Prevention Program Assistance through Improving Residential Sanitation in the Working Area of the Pegirian Community Health Center, Surabaya in 2020."

This community service activity aims to increase healthy settlements in the prevention of pulmonary TB disease in the working area of the Pegirian Community Health Center in Surabaya, including a. Increasing public knowledge about environmental-based infectious diseases such as TB and its

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prevention (PHBS, CTPS); healthy houses; the importance of lighting/ventilation in the house in preventing infectious diseases, b. Installing glass tiles to add lighting in the room. Issues raised in this community service activity is: "Pulmonary Disease Prevention Program Assistance through Improving Residential Sanitation in the Working Area of the Pegirian Community Health Center, Surabaya in 2020." This community service activity focuses on improving health through disease prevention and health promotion, including PHBS (Clean and Healthy Living Behavior) and CTPS (Hand washing with Soap) activities that need to be carried out to reduce the risk of TB disease transmission; also supporting the Surabaya Health Office Program and Pegirian Community Health Center in reducing the incidence or cases of TB in the working area of Pegirian Community Health Center , Surabaya in 2020

II. METHOD

The methods used in the implementation of community service include a) Training / Counselling on TB and Covid, Healthy Homes and Ventilation and lighting in the house and b) Physical Assistance Interventions in the form of Glass Roofs to people with pulmonary Tb. And c) correct hand washing practices based on WHO. In improving skills for people with TB in the Pegirian Health Centre Working Area of Surabaya City, this practical method is carried out both in the field and in the laboratory by inviting students to the activities we carry out.

III. IMPLEMENTATION

Community service activities at the Pegirian Health Center in Surabaya have been carried out as follows:

A. HEALTH COUNSELING

Health Counseling by Lecturers of the Environmental Health Department together with the Pegirian Health Center, Surabaya City as in FIGURE 1. The health education activity was attended by people with TB, families of TB sufferers and the community around the homes of patients who were the targets of these activities as in FIGURE 2. Counseling materials include:

1. Healthy settlement

This material begins with the definition of a healthy house, the requirements for floor construction, roof walls, lighting, ventilation, temperature and humidity that meet health requirements as in FIGURE 2.

Density of occupancy, basic sanitation facilities that should be in the house. Home security so that the occupants of the house avoid accidents. No less important is maintaining the cleanliness of the house both inside and outside the house. If a healthy house is understood then the collection of a group of houses is a settlement. Keeping the home environment clean is very important and is the responsibility of the residents who live in these settlements.

Figure 1. Community Service Participants and Pegirian Health Center Leaders and Staff after the Opening Ceremony

Figure 2. Counseling for Pulmonary TB Patients

2. Pulmonary TB disease and its prevention

This material begins with the understanding of pulmonary TB disease, the concept of disease transmission through the host, agent and environment, the mode of transmission of pulmonary TB disease. Prevention of transmission of pulmonary TB disease both by patients and their families.

3. Clean and Healthy Lifestyle (PHBS) and CTPS

Application of the values of a Clean and Healthy Lifestyle in household arrangements in the community so that people can create clean conditions in order to prevent the transmission of environmental-based diseases, especially pulmonary TB accompanied by demonstrations on how to wash right hand.

B. PHYSICAL ASSISTANCE ACTIVITIES

In Improving Home Health And Cleanliness Of The Residential Environment. To give an example of improving a healthy home, among others, by adding lighting in the house. Lighting in the house can function as lighting, killing certain disease germs such as Mycobacterium tuberculosis which causes tuberculosis, lighting can also reduce room humidity and reduce mosquito density[7][8]. To improve the lighting of the room in the patient's house, the implementation of activities is emphasized on providing assistance in the form of glass tiles. This is done with the consideration that the condition and the existence of the patient's house is not possible to add or repair the walls of the house because most families occupy houses that have very minimal distances from other houses. Some houses were found to have 1 wall for every 2 houses, meaning that the distance between houses that were close together did

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not allow making windows or ventilation as an effort to enter sunlight into the house as in FIGURE 3.

Figure 3. Lung TB patient's home condition

Motivating the hygiene movement in the context of preventing the transmission of pulmonary TB disease through improving the health of settlements, the assistance of cleaning tools in the form of brooms, scoops, trash cans, mops, dusters and cleaning materials such as soap, lisol and anti-septic is provided. This assistance was given to 20 families of sufferers.

C. MOTIVATING THE HOME AND RESIDENTIAL ENVIRONMENT CLEANLINESS MOVEMENT

This motivational activity was carried out together with the community, cadres, puskesmas officers and lecturers as in FIGURE 5. The activity is in the form of a movement to clean the home environment and settlements by the community. The next hope is that the community can maintain and regularly clean their homes. If the house and environment are clean, it is hoped that environmental-based diseases such as pulmonary TB can be prevented from spreading.

D. Monitoring and Evaluation

Monitoring and evaluation of the activities carried out related to the installation of glass tiles and the provision of 1 package of tools and cleaning materials as well as the provision of abate powder. 90 units of glass tiles have been installed, tools and cleaning materials have been used by each family, as well as abate powder, which has been sprinkled on water reservoirs.
Monitoring the activities of the environmental hygiene movement as a follow-up effort by assisting cadres in the working area of the Pegirian Public Health Center, Surabaya. Provide an example for the installation of glass tiles with the aim of increasing lighting in the homes of people with pulmonary TB and reducing room humidity, so as to reduce, as in FIGURE 6.

Figure 4. Motivating in Clean House and Residential Environment

Evaluation of the benefits of community service activities in the form of counseling the families of patients by looking at the enthusiasm of the community in asking questions related to preventing disease transmission. Evaluation has been done on the participants of the extension by filling out the distributed questionnaires. (Questioner Form attached)

Figure 5. counseling participants are filling out the distributed questionnaires.

the presence of disease-causing germs, especially TB bacilli. As many as 60 units of glass tiles were prepared which were installed in people's homes based on the results of the initial survey of the community service team of the Surabaya Public Health Study Program. Counseling participants are filling out the distributed questionnaires.

Figure 6. Delivery of Transparent Glass Tile Aid to the Health Center to be Delivered to Patients with Pulmonary TB Delivery of Transparent Glass Tile Aid to the Health Center to be Delivered to Pulmonary TB Patients

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Motivate the community to want to carry out cleaning of their homes and residential environment by providing examples of cleaning tools and cleaning materials that should be used. Evaluating community service activities in the Pegirian Health Center area together with the Puskesmas and local health cadres.

IV. RESULTS AND DISCUSSION

The forms of the community service activity that have been carried out in the working area Pegirian Community Health Center, Surabaya in 2020 are as follows:

Health Extension by Lecturers of the Department of Environmental Health of Surabaya together with the Pegirian Community Health Center, Surabaya. Extension to the community, especially the families of pulmonary TB patients, at the Pegirian Community Health Center, was attended by 41 people including people with TB (TB Patients), families of TB patients and the community around the houses of patients in the working area of the Pegirian

Community Health Center who were the targets of this activity. Extension materials are:

A. HEALTHY HOUSE

This material begins with the definition of a healthy house including the requirements for floor construction, roof walls, lighting, ventilation, temperature and humidity that meet health requirements. Occupancy density, basic sanitation facilities that should be available in the house. House security to protect the occupants of the house from accidents. Also, materials about maintaining the cleanliness of the house—both inside and outside. If a healthy house is understood then the materials are continued to the collection of a group of houses, which is a settlement. Keeping the house environment clean is very important and is the responsibility of the people/residents who live in that settlement. The results of the Pre-Post Test are as follows in DIAGRAM 1:

Based on the table Based on FIGURE 1. it can be seen that the extension activities regarding healthy homes for the pre-test - post-test results, namely respondents who understand about healthy homes with "Good" have increased from 31% to 81%, while those who are "Fair" have decreased from 38% to 11% and those who are "Less" have also decreased from 31% to 4%.

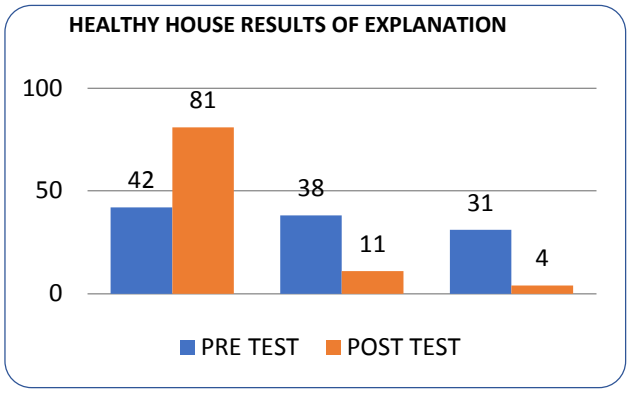

FIGURE 7. Pre-Post Test Results of a Healthy House for Community Service Participants at the Pegirian Community Health Center

B. *PULMONARY* TB AND ITS PREVENTION

This material begins with the understanding of pulmonary TB disease, the concept of disease transmission through the host, agent and environment and the mode of transmission of pulmonary TB disease[9][10]. Prevention of pulmonary TB disease transmission both by patients and their families. The danger of pulmonary TB transmission if patients refuse to wear a mask, cover their mouth and nose when coughing or sneezing, and not spit anywhere[11][12][13]. Lighting in the house can function to light up the house, kill certain disease germs such as Mycobacterium tuberculosis bacteria which causes tuberculosis; lighting can also reduce room humidity and mosquito density[14][15].

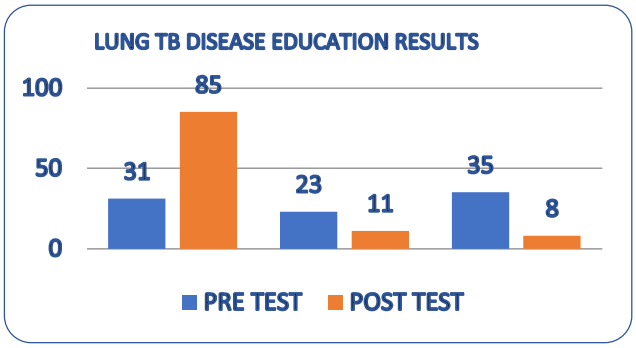

FIGURE 8. Pre-Post Test Results of a Healthy House for Community Service Participants at the Pegirian Community Health Center

Based on DIAGRAM 2. it can be seen that the extension activities regarding pulmonary tuberculosis disease and its prevention, the Pre-Post Test Results showed that the number of respondents who understand about pulmonary tuberculosis disease and its prevention with "Good" category has increased from 31% to 85%, while the number of respondents who understand about pulmonary tuberculosis disease and its prevention with[16] "Enough" category has decreased from 23 % to 11% and “Less” category also decreased from 35% to 8%[17][18].

From this extension activity, it is hoped that it can motivate the House and Settlement Environmental Cleanliness Movement. This motivational activity was carried out together with the community, cadres, Community Health Service officers and lecturers. The activity is in the form of a movement to clean the house and settlement environment by the community. Besides, it is also hoped that the community can maintain and regularly clean their houses. If the house settlement environment are clean, it is hoped that environmental-based diseases such as pulmonary TB can be prevented from spreading.

The extension on the application of the values of a Clean and Healthy Living Behavior in household arrangements in the community so the community can create a clean condition to prevent the transmission of environmental-based diseases, especially pulmonary TB, was accompanied by demonstrations on how to properly wash hands[19].

C. *PROVIDING PHYSICAL ASSISTANCE*

Giving example in improving house health and settlement environment cleanliness. An example in improving a healthy

house, one of which is by adding lighting in the house. To improve the lighting of the room in the patient's house, the implementation of activity was emphasized on providing assistance in the form of glass tiles[20]. This was done because the condition and the location of the patient's house did not allow for adding or repairing the walls of the house because most families occupy houses that have very minimal distances from other houses. Some houses were found to have 1 wall for every 2 houses, meaning that the distance between houses that were close together did not allow for making windows or ventilation as an effort to enter sunlight into the house. Thus, efforts were made in the form of installing glass tiles in the houses of 26 people with TB. Each patient got a glass tile that can be installed in the patient's room.

The purpose of this glass tile is to increase the intensity of lighting in the room so that patient does not have to use lights every day for indoor lighting. This activity was done with a consideration that according to the results of the previous study, the houses of most TB patients are lack of lighting, thus the rooms look dark and humid as it do not get direct sunlight—so, they become good environments for *Mycobacterium tuberculosis bacteria*[21][22][23]. However, unfortunately in this activity not all participants understood and understood about sanitation, because the educational background was still a junior high school graduate and the age of the participants was not young, making it less effective to receive counselling material[24].

Based on the results of measuring the intensity of lighting in the patients' houses, there were 26 patients' houses which results were < 60 lux. This is not in accordance with the Regulation of the Minister of Health of the Republic of Indonesia Number 1077 of 2011 concerning Guidelines for Indoor Air Sanitization (Regulation, 2011).

Lighting is closely related to the incidence of tuberculosis, as stated in a study, in which the TB odds ratio test was 6.667 times greater influenced by lighting that was less than 60 Lux, the possibility of the occupants of that house to have TB is higher than the occupants of the house with lighting levels that met the requirements, namely >60 Lux[21][25].

Evaluation of this implementation was carried out on the process and output of the activity that has been carried out. The indicators and criteria are installations of glass tiles to improve settlement sanitation as the implementation of study results, effectiveness of activity and contribution of targets in supporting the success of activity as well as activity output. The activity was originally planned to bring all pulmonary TB patients to the Pegirian Community Health Center, but due to the COVID-19 pandemic, it was replaced with door to door activity to the houses of pulmonary TB patients, so that researchers could see the condition of the patients' house at firsthand. This can actually help find out in which position the glass tile can be installed.

V. CONCLUSION

Pulmonary Disease Prevention Program Assistance through Improving Residential Sanitation in the Working Area of the Pegirian Community Health Center, Surabaya in 2020, can increase respondents' knowledge of 54% about a healthy house (requirements) and 38% about pulmonary TB disease. Installation of glass tiles was carried out on 26 respondents (Patients with Pulmonary TB) houses. The community was very enthusiastic and welcomed the community service team in the implementation of door-to-door extension and understood (the materials presented). The increase in the success rate of pulmonary tuberculosis treatment is due to the community, pulmonary tuberculosis patients and patients' families who are willing to be healthy so that they welcome enthusiastically and well to this community service activity.

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