

# ASSOCIATION OF NUTRITION AND OVERCROWDED ON THE RISK OF PULMONARY TUBERCULOSIS IN SAMOSIR DISTRICT NORTH SUMATERA

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## ABSTRACT

**Background:** Pulmonary tuberculosis is an infection diseases that continues to increase morbidity and mortality in Indonesia. In 2017, the cases of pulmonary TB in Samosir District was 252 cases, with incidence rate a smear-positive of 126 per 100,000 population. Smear positive pulmonary tuberculosis potential to infect other people who living in the same environment.

**Materials and Methods:** This study aims to determine the association of nutritional status and lighting with smear positive pulmonary tuberculosis. **Methods:** A case-control study was conducted among 63 cases of smear-positive pulmonary tuberculosis and 63 controls without pulmonary tuberculosis. The cases were retrieved from the TB Registry at health centre in Samosir District. The cases were recruited from June 2018 to March 2019. Data was collected using a set of questionnaire by interview. Simple logistic regression was used to compute the crude odds ratio for the association of nutritional and lighting with smear-positive pulmonary tuberculosis.

**Result:** This study indicated that there was an association of poor nutrition status (OR = 4.280; 95% CI: 1.849, 9.906), and an overcrowded (OR = 5.084; 95% CI: 1.852, 13.995) with the incidence of smear-positive pulmonary TB in Samosir District.

**Conclusion:** The conclusion of this study there was an association between poor nutritional status and an overcrowded with smear-positive pulmonary TB in Samosir District. Some interventions needed including strengthening health promotion and supplementary feeding to TB patient.

**Keywords:** nutritional status, overcrowded, pulmonary tuberculosis.

## 1.0 Introduction

Tuberculosis (TB) is a global health problem that is increasing every year. During 2017, one point three million people were reported dead due to TB infection in adults with a negative HIV test and an increase in deaths due to TB and HIV positive co-infections by 300 thousand according to the World Health Organization (WHO, 2018).

Estimates of sufferers globally in 2017 show that 10 million people suffer from TB consisting of five point eight million men, three point two million women and one million children. All cases were found spread in all countries and infect all age groups.

Ninety percent attack adults with age above 15 years and 10 percent infect children under 15

years. Two-thirds of cases were in eight countries, namely India at 27 percent, China nine percent, Indonesia eight percent, Philippines six percent, Pakistan five percent, Nigeria four percent, Bangladesh four percent and South Africa three percent (WHO, 2018).

Naramsinhan (2013) in his research on TB risk factors conducted in India, said that transmission occurs due to exposure to risk factors with the source of the case (*Mycobacterium tuberculosis*). The combination of intrinsic factors such as age, sex and social factors including occupation, contact history, nutritional status, immunization status, occupancy density and smoking behavior contribute to accelerate TB transmission. Pittalis et al. (2017) stated that the proportion of TB sufferers in the migrant population in Italy experienced material losses as much as four times higher than in patients with young age and eight times greater than in older people in native Italy. That indicates that the low socioeconomic status contributes to the risk of TB incidence.

Data and information Ministry of Indonesia center states that Indonesia ranks third in the world in the TB problem after India and China. According to that data states that men are more susceptible to TB infection by one point four times than women. This can be caused by men having high mobility such as farmers, fishermen, builders who need stronger energy compared to women who only stay at home as housewives so that men are more likely to be exposed to TB germs. The data is in accordance with the prevalence survey conducted by health research and development agencies in all districts and cities in Indonesia in 2013-2014. The survey results show that the prevalence of men is three times higher than that of women. This can arise because men are more exposed to risk factors for example smoking. Male respondents who smoked in this study were 68.5 percent and women were 31.5 percent (Republik Indonesia Ministry of Health's, 2017).

Based on data obtained from the P2 TB section of the North Sumatra Provincial Health Office in 2017 the achievement of cases in the Districts / Cities in the three highest sequences was Medan with 3,231 / 100,000, Deliserdang Regency with 2,084 / 100,000 and Simalungun with 944 /

100,000. While the 3 lowest regencies and cities are Binjai District 65 / 100,000, Pakpak Bharat at 76 / 100,000 and West Nias at 110 / 100,000 (Provincial Health Office, 2018).

The number of new TB smear positive cases finding in Samosir District started in 2016 with Case Notification Rate recorded in the regency register were 115 / 100,000 pulmonary TB population, in 2017 there were 126 / 100,000 population. One indicator used in control is the Case Detection Rate (CDR), which is the proportion of new positive smear pulmonary TB patients found and treated against the number of new smear positive pulmonary TB patients who are estimated to exist in one region (Samosir District Health Office, 2018).

Based on a preliminary survey conducted on June 28, 2018, patients in public Health centre working area of the Samosir District Health Office found 154 cases all types of TB, consisting of positive smear pulmonary TB, Extra Lung, X-ray and relapse. The results of the case finding in Samosir District were dominated by sputum examination for a diagnosis of TB smear positive compared to other diagnoses, which was 61 percent. Cases data in Samosir District was sourced from 12 puskesmas spread across 9 sub-districts. Patient classification from 154 new cases found consisted of 135 cases of pulmonary TB smear positive, 12 cases of extra lungs, 6 cases recurred and 1 case dropout. (Samosir District Health Office, 2018).

Incidence rate of pulmonary TB smear positive by age group in Samosir remains high, namely less than 34 years of 39 cases, 34 to 54 years was 65 cases, 55 to 74 years at 45 cases and the age group over 74 years at 5 cases in the age group 35 to 54 years the incidence of pulmonary TB in productive age. The percentage of cases of pulmonary TB smear positive in Samosir District more dominant on the male 73 % compared with 23 % of women.

Based on the fact that pulmonary TB smear positive is still a basic public health problem in Samosir District with a trend of incidence rate starting from 2015 which is 123 / 100,000 population of 164 TB cases of all types, throughout 2016 is 115 / 100,000 population of

262 TB cases of all types, and in 2017 with 126 new cases / 100,000 population of 252 TB cases of all types.

Based on that problem researcher wants to determine the association between nutritional status and population density on the risk pulmonary TB smear positive in Samosir District.

**2.0 Materials and Methods**

Type of this research is using an observational analytic epidemiological study with a case-control study design that aims to examine the association between certain effects (diseases or health conditions) with risk factors comparing case groups and control groups (Sastroasmoro, 2014). The location of this study was carried out in four Public Health Centre (PHC) in Samosir District among of theme Buhit PHC, Sirait PHC, Lontung PHC and Simarmata PHC than this research was conducted from June 2018 until complete. The sample of this research is aged after 15 years old who are living the area of four PHC starting from an area with a larger population proces to the next PHC. Sample size consists of 63 respondents in cases group and 63 in control group. andstarting from the most populous puskesmas and proceed to the next puskesmas until the number of samples is 63 cases and 63 controls compare between cases and control one to one than total sample was 126 person. Sampling tehniqe in this study was *proportional random sampling*.

The collection primary data obtained through interview with questionnaires and take measurement of nutritional status. Secondary data were obtained from reports District Health Office or documents Buhit PHC, Sirait PHC, Simarmata PHC, Lontung PHC and other data wich relevant to this research problems. Data analysis is univariate, bivariate with simple logistic regression and multivariate analysis with multiple logistic regression tests.

**3.0 Result**

**3.1 Univariate Analysis**

Based on the results of research conducted in Samosir District indicate that the nutritional

status in patients with smear-positive pulmonary TB is the respondents in the cases group with less category (BMI <18.5) is 65% and respondents in the control group is 25% and overcrowded wich uneligible were in cases group (44%) and (7 %) in control group.

**3.2 Bivariate Analysis**

This analysis was conducted with a simple logistic regression model test that mean the variable of nutritional status and overcrowded have p value less than 0,25 so that they can recomended multivariate analysis modeling with Multiple Logisticn Regression test.

Tabel 1 Association of nutrition and overcrowded on the risk of pulmonary Tuberculosis in Samosir District North Sumatera

Variable	Pulmonary TB Incidence			
	TB smear positive (cases)		Without TB (control)	
	n	%	n	%
Nutritional Status				
BMI (<18,5)	41	65	16	25
Normal (≥18,5)	22	35	47	75
Overcrowded				
Uneligible	24	44	7	11
Eligible	35	56	56	89

**3.3 Multivariate Analysis**

This model can explain that people who factor nutritional status less than 18,5 (BMI <18.5) and uneligible overcrowded on the risk of pulmonary TB in Samosir District. The result of this analysis shows that the independent variable can predict dependent variable by 92,3 percent and 7,7 percent influences by other risk factors.

**3.3.1 Table 2**

Summary Results of Multivariate Analysis Based on Multiple Logistic Regression Test Results

Variable	B	Sig.	OR	95% CI	
				Lower	Upper
	1,454	0,001	4,280	1,849	9,90
	1,626	0,002	5,084	1,852	13,9
	-1,677	0,000	0,187	-	-

#### 4.0 DISCUSSIONS

##### 4.1 Association of Nutritional status on the risk pulmonary TB smear positive incidence in Samosir District

According to multivariate analysis using multiple logistic regression, the value of odds ratio is 4.280 (95% CI 1.849-9.906) it means that respondents whose nutritional status is less than 18,5 (BMI <18.5) have a risk of 4.280 times to be infected with pulmonary TB smear positive compared to respondents with normal nutritional status (BMI  $\geq$  18.5).

This study found that respondents with pulmonary TB smear positive is a resident who has a weak economic level so that respondents are not able to meet the required nutrient intake. It can happen because respondents pulmonary TB smear positive is not working because of illness so that income there is not to meet the nutritional adequacy.

Efforts that can be made to improve nutritional status are utilizing home yards to grow vegetables to meet nutritional intake and backyard farms for raising chickens so that they can help to meet the nutritional intake of respondents pulmonary TB smear positif.

Efforts made by the TB prevention and control program (P2PM) Office Health District do counseling related to the danger posed by tuberculosis through a campaign of tuberculosis in the community assisted by officers tuberculosis community health center program. This effort is also coupled with the distribution formula for patients with pulmonary TB smear positive.

Kant et al (2015) states that nutrition has a significant association to the incidence of pulmonary TB where malnutrition associated with impaired immune function and normal health system responsible for immunity as a defense against a variety of infectious diseases such as pulmonary TB.

##### 4.1 Association of overcrowded on the risk pulmonary TB smear positive incidence in Samosir District

Based on research conducted in four health centers in Samosir District shows that most groups of patients with smear-positive pulmonary TB in residential density category are uneligible for 28 homes (44%) and among those with pulmonary TB instead of 7 (11%). Multivariate analysis using multiple logistic regression obtained p value = 0.002; OR = 5,084; 95% CI 1,852-13,955 it means that respondents who have a residential density overcrowded do not meet health requirements (<9 m<sup>2</sup> / person) at risk of 5,084 times pulmonary TB smear positive compared to respondents whose occupancy density meets health requirements (> 9 m<sup>2</sup> / person).

The conditions found in the study showed that most respondents pulmonary TB smear positive live in the house that serves as a dining room and bedroom at night without any barrier between the room in the house. If while the rooms are made in the respondent's house but did not match the size that qualify in accordance with the standards Permenkes in 2011 because the rooms are made only measures 1.5 by 2 meters.

In this study also found that family members who live in the house to sleep more than 2 people to sleep in the same room so that the possibility of transmitting *Mycobacterium tuberculosis* to other family members very quickly.

The house is occupied by respondents also serves as a storage of agricultural products such as onions, corn hung on the bottom of the roof of the house that serves to drain the agricultural products before being sold to the market. While the section under the house serves as a pet such as chickens and buffalo.

This study is according to Sumarni research (2012) in three health centers in North Lampung Regency indicate that there is the influence of density residential home with smear-positive pulmonary TB incidence. It means that the risk of smear positive pulmonary TB incidence is higher at 2,928 times the respondents who had not qualified residential density compared with the density of respondents eligible dwelling.

#### 5.0 Conclusion and recommendation

- 4.1.1 There is association of nutritional status on the risk of pulmonary TB in Samosir District
- 4.1.2 There is association of overcrowded on the risk of pulmonary TB in Samosir District
- 4.1.3 The most dominant variable on the risk of pulmonary TB smear positive is uneligible overcrowded with odds ratio value 5,084 (95% CI 1,852-13,955), it means that respondents who have uneligible residential density have risk of 5,084 times to ifected pulmonary TB smear positive compare to respondents with eligibile residential density.

**SUGGESTION**

1. Samosir District Health Office. As a policy maker to continue to improve the TB survey program in the work area of the puskesmas by involving all government and private sectors in TB prevention and control.
2. For all public health centres in Samosir District. Improving networking through village officials conducting TB campaigns, household contact with TB patients and tracking loss to follow-up cases so as not to become a source of transmission for people living together with smear positive pulmonary TB patients.
3. Community. People are more concerned about their health so that a clean and healthy living behavior associated with the understanding of a healthy home environment. It is expected that people do clean environment especially residential homes in the house does not take advantage of the ceiling of a house as a place of drying agricultural products, should be provided a special place outside the home as a place of drying agricultural products.
4. Researchers. The need for follow-up studies in order to understand better the factors that most influence with pulmonary TB smear positive.

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