The Relationship between Healthy Housing Conditions and Pulmonary Tuberculosis

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Abstract: Housing conditions are a factor that determine the state of hygiene and environmental sanitation. Housing and environments that do not meet health requirements are risk factors regarding disease transmission, for example, pulmonary tuberculosis. This research was conducted to determine the relationship between healthy housing conditions and the incidence of tuberculosis in Palengaan, Pamekasan. This was an observational study, based on its time and was a case-control study. Data analysis was conducted using a Chi-square test with $\alpha = 0.05$. This study assessed healthy housing conditions using the observation sheet from the technical guidelines of the assessment regarding healthy housing conditions by the Directorate General of Communicable Diseases Eradication and Environmental Health in 2002.The variables used, resulting from the housing health assessment include: (a) house components; (b) sanitary facilities; and (c) occupant behavior. Individual characteristics include: a) age; (b) gender; and (c) education, and residential density. Based on the study results, the assessment for healthy housing conditions are associated with the incidence of pulmonary TB; the Chi-square test indicated $p = 0.000$, OR = 35.10, and in three groups of house health assessments, the behavior of occupants is associated with the incidence of pulmonary TB, with the chi-square test $p = 0.001$, OR = 8.233. it can be concluded that houses with healthy conditions can reduce the risk of pulmonary TB incidence and, in particular, poor behavior of occupants can increase the risk of pulmonary TB incidence.

SCIENCE AND TECHNOLOGY PUBLICATIONS

1 BACKGROUND

Public health is a science and the art of preventing disease, prolonging life, and improving the efficiency of life through efforts or attempts of community organization. Community organization is an effort to improve the environment and prevent and combat contagious diseases. This is in line with objectives for the prevention and improvement of public health. The goal of public health is the whole community, including individuals, families, and groups both healthy and sick, especially those at high risk in the community. Some special groups are at risk and require supervision and guidance, for example, patients with pulmonary tuberculosis. Public health has basic components comprising of humans, health (the healthy-sick concept), and the environment.

Humans have needs that are continually evolving and changing. Abraham Maslow in Mubarak (2009) says that human needs are structured in a hierarchy and the most basic needs (physiological) include food, water, fresh air, temperature, free from illness, rest, sleep, and activity. All these needs must be prioritized, and a house is a means of manifestation of these basic needs. This reflects work by Robert Moroney in Mubarak (2009), who classifies human needs and mentions houses as normative needs.

Human basic needs consist of food, clothing and housing. Houses, also known as residences or homes are a basic human needs. Every human being across the world needs a place to live. The shape of housing inhabited by each nation is different, and even in one country or one city, housing can take various shapes. Houses are become more varied; each component of a house must fulfill health requirements, so the inhabitants do not suffer hurt from any illness (Azwar, 1995). The components of houses that fulfill health requirements are expected to provide comfort and can maintain the health of the inhabitants; residents can avoid diseases, work productively, and produce something meaningful.

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The population of Indonesia is continually increasing. In addition the population spread is becoming more uneven, mainly because of the urbanization that is becoming more rampant every year. This rapid growth rate will automatically increase the community's needs for shelter or housing. With people's increasing levels of need for housing, this will increase the procurement of housing in Indonesia, primarily in urban areas. This has led to an increase in social problems and resulted in a slum housing environment that does not meet health requirements. Surabaya, which is also a metropolitan city with rapid development and becoming a common urbanization destination, is a target of arising social problems. Problems arising from the needs of the community needs to be handled by the government immediately, including the procurement of housing for the middle to lower economic level of the community. According to the United Nations Conference regarding the Problem of the Human Environment (1972), more than 1 billion people live below standard conditions and it is likely that the situation will get worse in the future (WHO SEARO, 1986; WHO Commission on Health and Environment, 2001). The housing situation is a factor that determines the condition of hygiene and environmental sanitation. Overcrowding and narrow housing results in high incidences of illness, accidents, and other issues (Sukarni, 1995).

Based on the Household Health Survey (SKRT) conducted in 1995 (DG PPM and PL, 2002), the 3rd leading cause of death in Indonesia is tuberculosis. Tuberculosis, commonly referred to as TB, is closely related to unhealthy house sanitation conditions. Meanwhile, according to the WHO report (2007) on Global Tuberculosis Control Surveillance, Planning, and Financing stated that Indonesia was ranked fifth with the highest number of tuberculosis patients in Southeast Asia after Bangladesh, Bhutan, DPR Korea, and India.

WHO also reports that 10 to 20 million people with tuberculosis in the world can transmit tuberculosis. Because of pulmonary tuberculosis, the mortality rate is around 3 million patients each year. This situation is increasing and almost 75% are found in low-socio-economic developing countries (Alsagaaf, 2008).

The Annual Risk of Tuberculosis Infection (ARTI) including the risk of transmission of tuberculosis infection in Indonesia, is considered quite high and varies between 1% and 3%. Areas with an ARTI, numbers of 1% suggest that every year, of 1,000 residents, ten will be infected. From the infected people, only 10% will become tuberculosis patients. Thus, it can be estimated that, in an area with an ARTI of 1%, among 100,000 residents there will be 100 tuberculosis patients on average per year, 50 of which will be positive acid-fast bacilli (MOH, 2002).

In Indonesia, tuberculosis disease is still developing. This is related to the deterioration of the socio-economic conditions of society, public health service facilities that are not yet optimal, the number of people, which is continually increasing, many of whom do not have permanent residence. The development of the disease is not separate from human behavior; mainly the behavior of the inhabitants in the house (Sukarni, 1995).

Based on the Pamekasan district health office report in 2011, there were as many as 759 people suffering from tuberculosis during 2010. In Pamekasan, from 2011 to May 2018, there were 610 residents who are known to suffer from tuberculosis. The number of tuberculosis patients is mostly incrasing in three districts: District Palengaan, Pasean, and District Palengaan. The number of TB patients in the Pamekasan District is high in East Java, and the government are trying to implement treatment. The government said, Pamekasan District was ranked fifth in East Java regarding cases of TB, after Sumenep, Lumajang, Malang, and Jember. According to the latest data from the health services for 2012 and 2013, there are three Community Health Centre that successfully identified TB during 2012. Palengaan Health Community Center identified 111 patients, the Pasean Health Community Centre identified 96 patients, and there were 68 patients identified by the Waru Community Health Center. For the first quarter of 2013, 22 patients came from Pasean, 19 from Palengaan, and 17 from Batumarmar Community Health Center.

It takes six months of treatment to cure the infectious disease. If within that six months of treatment, one day is missed, the treatment must then start all over again. Drugs are provided free of charge at every health service center under the health agency. A house that becomes a home and shelter for its inhabitants, can guarantee their health. A house assessed as having healthy conditions has become a determining requirement for the health status of its inhabitants. Components of a house and its environment that do not meet health requirements are risk factors and a source of transmission of various types of diseases, especially environmental diseases (Keman, 2005). Unhealthy housing conditions will have a negative impact on human health; one impacting result is tuberculosis. Efforts to control risk factors that influence the occurrence

of health threats have been regulated in Kepmenkes RI. 829/Menkes/SK/VII/1999 regarding housing health requirements.

Previous studies, such as research by Nur Yasiroh (2009) and Machrita Hanum (2010) only analyze the relationship between each component, i.e. the physical quality of the house with the occurrence of pulmonary TB, including physical qualities such as ventilation, room area, floors, and walls. The health status of housing has not yet been studied through conducting a healthy house assessment in relation to the occurrence of pulmonary tuberculosis. Therefore, the researchers want to determine the relationship between TB occurrence rates in the work area of Kedurus Health Center, with the results of a healthy housing assessment.

The purpose of this research is to analyze the relationship between healthy housing conditions and the occurrence of Pulmonary TB in the Palengaan District of Pamekasan Regency.

2 METHODS

Case Control Research is an epidemiologically designed study that examines the relationship between exposure (factor research) and disease by comparing case groups and control groups based on their exposure status (Murti, 1997).

Case Population: Pulmonary TB patients with positive BTA diagnosis in the Karang Pilang district and undergoing examination at Kedurus Community Health Center from January to December 2012.

Population control: Communities in the area who did not have pulmonary TB during the same period with the same age and sex and who were neighbors of the patient in the case population.

Research variables: there are two types, which are dependent variables and independent variables. The dependent variable in this study is the pulmonary TB patients with BTA positive test results; the independent variable is comprised of several components, such as: 1. house construction; 2. sanitation facility (clean water facility, latrine, and waste disposal facility); 3. Inhabitants' behavior; and 4. The density of inhabitants (house ceiling, wall, floor, bedroom window, window of family room, ventilation, kitchen smoke hole, lighting).

3 RESULTS

3.1 Characteristics of the Respondents

3.1.1 Respondents' Age

The case groups and control groups in this study have the same proportion of age groups. In the case and control groups, the largest age group is the 21 to 30-year age group, with nine respondents (29%). The results of this study describe the distribution of age almost evenly in each age group and the same thing occurred in the case groups and control groups.

According to Crofton (2002), there is almost no difference in the risks of developing pulmonary TB before puberty. The highest occurrence of pulmonary tuberculosis is usually during young adulthood. In women, the prevalence peaks at age 40–50 years, and later decreases, whereas in men the prevalence continues to increase until at least 60 years old.

The results of this study have the same percentage between case groups and control groups. This is because during the selection of controls, matching techniques that equalized age were used, therefore the researchers do not expect age to be factor associated with the occurrence of pulmonary TB. Thus, the results do not support the theory presented by Crofton (2002). Based on other studies, according to DG, PPM, & PL (1999), tuberculosis can occur in all age groups, and not just in adults, hence the matching results of this study.

3.1.2 Respondents' Gender

The case group and control group in this study have different gender proportions. In the case group, the highest number of respondents is male with 19 respondents (61.3%), while in the control group, the dominant respondents are also male respondents with 19 respondents (61.3%).

Crofton (2002) mentions that there is almost no difference in the risks between men and women of infection with the TB bacteria regarding the age of puberty. The number in males is quite high at all ages, whereas, in women, it tends to decrease beyond the age of fertility.

The equality of proportions in both groups is due to the selection of controls using matching techniques that equalized gender, therefore the researchers do not expect gender to be one of the factors associated with the occurrence of pulmonary TB.

Based on the theory presented by Crofton (2002), the risks between men and women are no different; all people can suffer from Pulmonary TB. According to Crofton's (2002) statement, the number of males is greater, based on research results. This is true yet still cannot be proven with certainty, because the results of male control groups suggest a larger number of those who do not suffer from pulmonary TB.

3.1.3 Respondents' Education

Level of education is not directly related to the occurrence of infection by TB germs, but an educated person and a high level of education will usually be the same as for a capable person. Capable means that the person tends to have sufficient economy to provide adequate nutrition and healthy housing although this is not yet ascertained. An educated person has broad knowledge that can affect a person's behavior. This also cannot be ascertained.

The results showed that the education level of respondents has a different percentage. In the case group, as well as the control group, the level of education of respondents is the same, i.e. respondents with junior high school education have a large number in each group. However, the numbers are not identical. In the case group there were 25 respondents (80.6%) while in the control group there were 30 respondents (96.8%).

The relationship between respondents' education status with the occurrence of pulmonary tuberculosis was based on calculation results using a Chi-square statistic test: (p) = 0.104> (α = 0.05), meaning H0 accepts that there is no relationship between educational status and the occurrence of pulmonary TB.

The higher level of education in the control group indirectly illustrates that the control group respondents have more ability and knowledge, but based on the results of research with the analysis using the Chi-square statistical test, the education level of respondents is not related to the incidence of pulmonary TB. In the case group, there were many respondents who had completed junior high school. Good education cannot directly affect one's behavior or ability, so the unconfirmed theory is indeed refuted by the results of this study.

3.2 House Health Assessment

Table 1: The distribution of respondents based on the house health assessment in Palengaan District.

Health Assessment	Case		Control		Total	
	P	%	P	%	P	%
Healthy House	5	16.1	27	87.1	32	51.6
Unhealthy House	26	83.9	4	12.9	30	48.4
Total	31	100	31	100	62	100
	P: 0.000		OR: 35.10			

Table 2: The distribution of respondents based on house components in Palengaan District.

House components	Case		Control		Total	
	P	%	P	%	P	%
Healthy house	18	58.1	24	77.4	42	67.7
Unhealthy house	13	41.9	7	22.6	20	32.3
Total	31	100	31	100	62	100
	P: 0.174					

Table 3: The distribution of respondents based on sanitation facilities in Palengaan District.

Sanitation facilities	Case		Control		Total	
	P	%	P	%	P	%
Healthy house	30	96.8	31	100	61	98.4
Unhealthy house	1	3.2	0	0	1	1.6
Total	31	100	31	100	62	100
	P: 1.000					

Table 4: The distribution of respondents based on inhabitant's behavior in Palengaan District.

Inhabitant's behavior	Case		Control		Total	
	P	%	P	%	P	%
Healthy	5	16.1	19	61.3	24	38.7
Unhealthy	26	83.9	12	38.7	38	61.3
Total	31	100	31	100	62	100
	P: 0.001		OR: 8.233			

Table 5: The distribution of respondents based on residential density in Palengaan District.

Residential density	Case		Control		Total	
	P	%	P	%	P	%
Dense	6	19.4	3	9.7	9	14.5
Sparse	25	80.6	28	90.3	53	85.5
Total	31	100	31	100	62	100
	P: 0.473					

4 DISCUSSION

Although houses may vary, each component of a house must fulfill health requirements, so the inhabitants do not suffer from any illnesses (Azwar, 1995). Components of houses that fulfil health requirements should provide comfort and maintain the health of inhabitants, so they can avoid disease, work productively, and produce something meaningful.

Housing conditions can determine the level of hygiene and environmental sanitation. Overcrowded and narrow housing results in high incidences of illness, accidents, and other issues (Sukarni, 1995).

Based on Kepmenkes RI No. 829/Menkes/SK/ VII/1999, technical guidelines for the assessment of healthy homes have been formed to improve housing conditions. The home parameters evaluated in the healthy house assessments include three groups of assessment components, comprised of housing components, sanitation facilities, and inhabitants behavior. It aims to assess whether the house has met the criteria of healthy housing conditions or the opposite.

The results indicate that there are differences in the proportion of home health assessments held by the respondents in the two groups. The proportion of The dominant evaluation in the case group assessment was unhealthy, with 26 respondents (83.87%). The same assessment in the control group indicated only four (12.9%) respondents with unhealthy housing. The result of statistical test shows that $P = 0.000 < (\alpha = 0.05)$, which indicates that there is a relationship between house health status and Pulmonary TB incidence. Thus, the results of this study support several theories that have been described previously.

Environment is a factor that causes the occurrence of disease. The environment referred to in this case is the physical environment of the house. Poor environment can certainly disrupt the balance in the process of interaction, involving two other factors: the agent and the host. The process runs dynamically and if one is disturbed it can affect the other, causing the occurrence of disease on the host (Mubarak, 2009). Unhealthy environmental conditions will also increase the disease-causing agent to develop and will facilitate the process of disease transmission, in this case, pulmonary TB.

The assessment of a healthy house includes three important things, one of which is the components of the house. The results of the component assessment were obtained based on the total score of eight variables comprising of ceilings, walls, floors, bedroom windows, living room windows, ventilation, kitchen smoke holes, and lighting. The provision of residential health requirements according to Kepmenkes No.829/Menkes/SK/VII/ 1999; components and arrangement of houses are also listed within it.

According to The American Public Health Association (APHA) in Azrul Azwar, healthy housing must be built in such a way that it can be maintained, including the temperature of the environment, and the meeting of basic physical needs. This is to prevent heat loss or excessive heat (body temperature) and to ensure lighting and home ventilation is sufficient so that fresh air can be experienced. According to the Directorate General of Human Settlements (1997), healthy housing should include foundations, walls, ceilings, floors, a roof, and ventilation. Houses with good components in accordance with health requirements, should protect inhabitants from disease.

Results indicate that in the case group, there were 18 respondents (58.10%) with healthy housing and in the control group there were 24 respondents assessed with healthy housing (77.4%). Thus, the results of statistical tests show the value (p) = $0.174 > (\alpha = 0.05)$ means that H0 is accepted, indicating that there is no relationship between the healthy components of housing and the incidence of pulmonary TB.

This result is because most of the respondents in both the case and control groups have healthy house components. This resulted in no significant difference, so there was no relationship. The assessment of healthy housing in the case group occurred due to healthy criteria being met regarding the eight variables. If one variable is badly rated, the house can still be judged as healthy, because of the high value of the other variables.

The components of a healthy house are important, but they must also be accompanied by healthy behavior and maintenance. House components of just one example of physical environmental factors. The physical environment can have an effect if it is in an unhealthy condition, so as much as possible it needs to remain in good health, via a healthy maintenance process. Behavioral factors and people's lifestyle today still cause harm to health, hence a higher awareness is required.

According to Krieger and Higgins (2002), healthy housing should provide facilities and infrastructure that includes the availability of clean water and sanitation of waste disposal. The concept of healthy housing involves the sociological and

technical approaches to risk factor management: qualification, adaptation to the surrounding environment, management and maintenance of the house with the surrounding environment, and the concept of healthy house, include the availability of sanitation facilities and clean water, adequate means for cooking and washing, means for the disposal of human waste or other waste, and, most importantly, the provision of drinking water (WHO Commission on Environmental Health, 2001).

For the assessment of healthy housing in this study, the second assessment group assessed the availability of sanitation facilities in which there are four variables. These variables include facilities for clean water, sewerage, waste water disposal, and garbage disposal.

Results indicate that almost all respondents in the case group and control group have healthy sanitation facilities. The results of the statistical test achieved the value (p) = 1.00> (α = 0.05) and shows that there is no relation between sanitation facilities and the incidence of pulmonary TB. This is because the two groups have no significant differences meaning that there is no relationship.

The cause is like the components of the house that have been analyzed beforehand between the case group and the control group for the appropriate availability of sanitation facilities; one inappropriate variable does not affect the result of the assessment because the other variables are appropriate and considered healthy.

Pulmonary TB disease is closely related to poor home sanitation, but the most influencing factors of poor sanitation are the components of the house. House sanitation assessments include four variables: the availability of clean water, sewerage channels, latrines, and waste. However, these are not the main reasons for the transmission of pulmonary TB. Thus, if the results of the assessment of home sanitation meet the healthy criteria, this does not mean it can be free from pulmonary TB. This is due to host factors and other affecting environmental components.

Behavior is the activity of an organism. Human behavior is the activity of a human. Factors that influence the emergence of behavior can be genetic and environmental. Genetic factors are a basic concept for the development of subsequent human behavior, while the environment is the land condition for the behavior it develops (Notoatmodjo, 2003).

According to Notoatmodjo (2003), health behavior is a response of a person or organism against the stimulus that is associated with an incidence of disease, the health care system, food, and environment. Stimulus in health behavior consists of four basic elements. One of the key elements is the behavior towards a disease.

The human response to a disease can be passive in knowing and perceiving or it can be acting upon that knowledge. This behavior towards corresponds to levels of disease prevention including, among other things, improving and maintaining health behavior, disease prevention behavior as a response to prevent the occurrence of disease, and behavior related to the search for treatment, either through health services or using traditional medicine.

The results indicate that there is a difference in the percentages of inhabitants' behavior between the case group and the control group. In the case group there were only five inhabitants (16.1%) who demonstrated healthy behavior. In the control group the number with healthy behavior was greater, at 19 respondents (61.3%). The results of the statistical test show the value (p) = 0.001 < (α = 0,05), meaning there is a relationship between the behavior of inhabitants and incidences of Pulmonary TB. Thus, the results of this study support several theories that have been described previously.

Behavior is one example that can affect the host. Behavior can increase or reduce sensitivity to illness and, of course, bad behavior can degrade the health status of the host (Mubarak, 2009).

This is of course in accordance with the hypothesis of this study; relationships that occur and increase the incidence of pulmonary TB. Thus, in the process it will be conducted by one factor (host) and will affect the process and other variables (agents and environment) through the disease (Pulmonary TB).

Healthy houses should have a bedroom width of at least $8m^2$ and it is recommended that no more than two people use one bedroom space. The floor area of the building must also be adjusted to the number of inhabitants.

The area of the building should be at least $3m^2$ for each family member (Notoatmodjo, 2003).

Residential density is the floor area of a room in a house divided by the family members occupying the room, so $4m^2$ per person would meet the health requirements for residential density. This is like the opinion expressed by Lubis (1997), who states that residential density is the number of people in a living space compared to the floor area that has exceeded existing provisions.

Based on the results of the research the seven respondents (22.58%) in the case group lived in densely populated houses, while three respondents

(9.68%) in the control group lived in densely populated houses for (p) = 0.30> (α = 0.05), which indicates there is no relationship between the density of residence and incidence of pulmonary TB.

Compared with previous research by Machrita Hanum (2010), the results of this study are not the same. Previous studies have suggested that residential density is associated with pulmonary tuberculosis incidence. This difference may be due to the present research being conducted in non-densely populated areas, so that between case groups and control groups there are no significant differences.

In other studies by Isye (2005) and Nur Yasiroh (2009), the results indicate the same thing; residential density is not related to healthy housing, although the cause is different.

5 CONCLUSIONS

Home health assessments were based on the Chi-square statistic test with the result (p) = 0.000 <α = 0.05, which indicates that house health is related to pulmonary TB incidence. A healthy house can reduce the incidence of pulmonary TB, while unhealthy housing has a 35.10 times greater risk of having pulmonary tuberculosis compared to healthy houses.

Health Officers are expected to monitor and improve sanitation of housing and settlements, and to further improve counseling regarding a clean and healthy life to create a healthy environment. In this case, healthy behavior was assessed to maintain the health of the house. Supervision should be conducted once each year, then counseling is provided at least three times a year in accordance to the recommendations in the technical guidelines of healthy housing.

REFERENCES

Alsagaf, H dan Mukty, A. 2009. Dasar dasar Ilmu Penyakit Paru. Surabaya: Airlangga University Press.

Azwar, A. 1995. Pengantar Ilmu Kesehatan Lingkungan. Jakarta: MutiaraSumber Widya.

Anonim. 1997. Rumah dan Lingkungan Pemukiman Sehat. Jakarta: Ditjen CiptaKarya Departemen Pekerjaan Umum R.I.

Crofton, J dan Norman,H. 2002. Tuberculosis Klinis. Edisi II. Jakarta: WidyaMedika.

Depkes RI. 2002. Pedoman Nasional Penanggulangan Tuberculosis. Jakarta: Departemen Kesehatan R.I.

Dinas Kesehatan Kabupaten Pamekasan, 2012. Laporan Tahunan P3M

Ditjen PPM dan PL. 2002. Pedoman Teknis Penilaian Rumah Sehat. Jakarta: Departemen Kesehatan R.I.

Keman, S. 2005. Jurnal Kesehatan Lingkungan Vol.2, No.1. tentang KesehatanPerumahan. Surabaya: Airlangga University Press.

Kepmenkes RI No. 829/ Menkes/ SK/ VII/ 1999 tentang Persyaratan KesehatanPerumahan. Jakarta: Departemen Kesehatan R.I.

Komisi WHO mengenai Kesehatan dan Lingkungan. 2001. Planet Kita KesehatanKita.

Kusnanto H (Editor). Yogyakarta: Gajah Mada University Press.

Lubis, P. 1997. Perumahan Sehat Proyek Pengembangan Pendidikan TenagaSanitasi Pusat. Jakarta: Depkes.

Mubarak, W dan Chayatin, N. 2009. Ilmu Kesehatan Masyarakat: Teori danAplikasi. Jakarta: Salemba Medika.

Mukono, 2006. Prinsip Dasar Kesehatan Lingkungan. Edisi Kedua. Surabaya: Airlangga University Press.

Notoatmodjo, S. 2003. Ilmu Kesehatan Masyarakat Prinsip-Prinsip Dasar.Jakarta : Rineka Cipta.

Notoatmodjo, S. 1993. Metodologi Penelitian Kesehatan. Jakarta: Rineka Cipta.

Olivia, I. 2005. Hubungan Antara Keadaan Sanitasi Lingkungan Rumah denganKejadian TB Paru. Skripsi. Unair.

Panudju, B. 1999. Pengadaan Rumah Kota dengan Peran Serta MasyarakatBerpenghasilan Rendah. Bandung: Penerbit Alumni.

Sanropie, D. 1988. Pengawasan Penyehatan Lingkungan Pemukiman. Jakarta: Departemen Kesehatan R.I.

Soedarsono. 2006. Aspek Pemberantasan Infeksi Mycrobacterium tuberculose

Simposium Akbar Penyakit Tropik dan Infeksi. Surabaya: YayasanPenerbitan FK UHT.

Soeparman. 1999. Ilmu Penyakit Dalam. Jilid II. Jakarta: Balai Penerbit FK UI.

Sukarni, M. 1994. Kesehatan Keluarga dan Lingkungan. Yogyakarta: Kanisius.

Undang –Undang RI No. 4 Tahun 1992 tentang Perumahan dan Pemukiman.Jakarta

Yasiroh, N. 2009. Pengetahuan, Sikap, Tindakan dan Lingkungan RumahPenderita TB Paru di Wilayah Kerja Puskesmas Pegirian tahun 2008-2009. Skripsi.Unair.

WHO. 2007. Global Tuberculosis Control Surveilance, Planning, Financing-WHO Report. Geneva: Switzerland

WHO. 2017. GLOBAL TUBERCULOSIS REPORT 2017. Geneva: Switzerland