

A Retrospective Case Control Study : Consumption Pattern and Nutritional Status for Pulmonary Tuberculosis Patient at Pakis Community Health Center District of Malang

Sandy Ardiansyah
Nutrition Departement Health
Polytechnic Ministry of Health,
Bengkulu
sandy_ahligizi@ymail.com

Emy Yuliantini
Nutrition Departement Health
Polytechnic Ministry of Health,
Bengkulu
emyardi2017@gmail.com

Kamsiah
Nutrition Departement Health
Polytechnic Ministry of Health,
Bengkulu
kamsiah74@yahoo.com

Abstract : *Tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis*. In the control of the immune system, tuberculosis is a cell-mediated disease. The availability of food household and fulfillment of energy and nutrients will affect on nutritional status sufferers patient of TB during the healing. The purposes of the research to analyze food consumption and nutritional status to incident pulmonary tuberculosis. Observasional research with design case control study at Pakis Community Health Center District of Malang. There are 60 sample such as 30 as TB or case and 30 as non TB or control. As data research are characteristics (age, education, work, income, and all of members), consumption pattern level, energy consumption and nutrient level, and nutrition status obtained by interview and measurements. The result showed that consumption pattern of the control group better than patient of TB each as much as 60% and 33,3% appertain very low. The level of energy consumption, proteins >50% appertain deficit level mild to severe nutritional status of lacking to heavy in patient TB of 66,7%. Need more research about main intervention for patients of TB by counseling education consumption pattern on their low socioeconomic status and giving supplementary feeding high energy and micro nutrient supplementation.*

Keywords : *Tuberculosis, Consumption Pattern, Energy and Protein Consumption Level, Nutritional Status*

I. INTRODUCTION

Indonesia ranks third in the countries with the highest burden of Tuberculosis (TB) in the world after China and India. The estimated number of deaths from tuberculosis is estimated at 61,000 deaths per year [1]. WHO

report in the WHO Report 2011 Global Tuberculosis Control, the incidence rate of tuberculosis in 2011 amounted to 189 per 100,000 population decreased compared to 1990, which was 343 per 100 000 population [2].

The National Health Survey in 2004 showed the prevalence of tuberculosis based on sputum smear examinations in the population aged more than 15 years is 240 per 100,000 population [3]. The East Java Health Service in 2004 found 789 patients with acid resistant bacilli or positive smear (contagious) while in 2005 there were 809 patients. This incidence continues to increase with the target of TB cases finding at 70% and the range of case finding ranges from 2800 to 2900 sufferers [4].

The economic crisis caused low family purchasing power and increased food prices related to the decline in food availability at the family level. Family purchasing power is influenced by two factors, family prices and income. If food security in the household decreases, consumption of food and consumption of nutrients per family member decreases, causing nutritional problems and infectious diseases to increase [5]. The family's energy food availability is 1930 Calories which do not meet the energy food availability standard, which is 2150 Calories. [6]. In line with Siswanto, et al (2006) research

shows there is a significant relationship between the level of energy consumption and the incidence of tuberculosis. Energy consumption of TB patients is still below the adequacy rate because patients experience anorexia and appetite which tends to decrease so that the nutritional status of TB patients also decreases [7].

TB is an infectious disease caused by *Mycobacterium tuberculosis*. In the control of the immune system, tuberculosis is a cell-mediated disease. Effector cells are macrophages and lymphocytes (Tcells) are immune-responsive cells. This type of immunity is local, involving macrophages that are activated at the site of infection. This reaction is called cellular hypersensitivity that occurs 3-10 weeks after infection [8]. According to Nursanti (2002), people with poor nutritional status will result in inhibited antibody and lymphocyte production so that the healing process becomes inhibited. Healing of tuberculosis to a healthy condition requires consumption of energy, protein and nutrients that are sufficient and balanced [9].

The results of Ruswanto, et al (2012) showed that the risk factors for nutritional status were significant with an odds ratio of 2.92, which means that nutritional status with a BMI <18.5 (underweight) would have an indication of tuberculosis of 2.92 times compared to the status good nutrition [10]. Likewise, the results of Rusnoto's research, et al (2006) showed an odds ratio of 14.01 in nutritional conditions (less weight) [11]. Furthermore, Khan, et al (2012) showed that the nutritional status of TB patients by 70% is poor nutritional status. Based on the study results of the study showed that nutritional status is a high risk factor for the incidence of tuberculosis [12].

Poor nutritional status will cause nutritional deficiencies that cause weight loss and eventually shrinkage. Nursanti (2002) research shows that poor nutritional status is a risk factor for tuberculosis at 4.5 times compared to good nutritional status [9]. Poor nutritional status will affect the formation of antibodies and lymphocyte formation in the presence of germs. The formation of antibodies requires raw materials in the form of energy, protein and nutrients so that food consumption has an important effect on this matter. The level of energy and protein consumption of low pulmonary TB patients will also affect the food consumption of micronutrients [9].

Since 2009, the monitoring and evaluation program for healing TB patients has been carried out by the Pakis Community Health Center District of Malang. Results of the distribution of TB cases have increased from 2009 until 2012. Increased incidence of tuberculosis is the highest in the area of Malang Regency. During this time the completion of TB cases was carried out only in terms of treatment. Therefore, the analysis of consumption patterns and nutritional status is very important for TB patients as detection and evaluation of programs carried out in order to increase the fulfillment of energy, nutrients and nutritional status.

The general objective of the study was to analyze consumption patterns and nutritional status on the incidence of tuberculosis in the Pakis Community Health Center District of Malang. Specific objectives of the study are 1) Analyzing characteristics including age, education level, occupation, income level and family size, 2) Analyzing consumption patterns (type, amount, frequency and food food patterns), 3) Analyzing the level of

protein energy consumption, 4) Analyze nutritional status. The research is expected to be used as a consideration in providing guidance to the community as well as consideration in providing nutritional services to TB patients.

II. METHODS

The type of research used is Analytical Observational with Case Control research design which is an analytical research (survey), where the effects (TB disease) are identified at this time, then risk factors are identified in the past which is field research. This research was conducted at Pakis Community Health Center District of Malang in June - July 2013. The sample in this study amounted to 60 people, namely the case group or TB patients as many as 30 people and a control group. The data taken included characteristics (age, education, occupation, income, and number of members), consumption patterns and consumption levels of energy and nutrients, as well as nutritional status obtained by interviews and measurements. Variables that have been processed and grouped according to the scale of data, then carried out different tests, namely the variable with the ratio data scale (parametric) analyzed by different test Independent Sample T-test and nominal or ordinal (non-parametric) data scale with Mann Whitney.

III. RESULT

Description of the characteristics of respondents in the case and control groups is presented in Table 1 where most of the characteristics showed a non-significant difference ($p > 0.05$) between the case and control groups. The ages of the case and control groups were mostly between 19 - 49 years,

which were 90% and 73.3%, respectively. The results of statistical analysis of Independent t-Test at a 95% confidence level showed a non-significant difference ($p = 0.770$). The education level of the majority of respondents in the case and control groups was elementary school, respectively 40% and 63.3%. The education of respondents with high school levels from the case and control groups was very small, at 23.3% and 20% respectively. The results of Mann Whitney statistical analysis at 95% confidence level showed a non-significant difference ($p = 0.147$).

Furthermore, the majority of the main jobs in the majority of cases are workers at 40%, namely construction workers, and factory workers, while the control group of 50% are housewives. The results of Mann Whitney statistical analysis at 95% confidence level showed a non-significant difference ($p = 0.143$). Large families range from 2 - 9 people with an average family size of 3 ± 1 person.

Most of the case and control groups that have large members with a range of 2-4 people were 86.7% and 76.7% respectively. The results of the Independent t-Test statistical analysis at a 95% confidence level showed a non-significant difference ($p = 0.095$). Per capita income per household per month ranges from Rp. 150,000 to Rp. 1,000,000 with an average of Rp. $415,138 \pm 185,042$. The line limit to the respondent's poverty is Rp. 443,118. Based on this limitation, most of the case and control groups were poor households at 76.7% and 46.7%, respectively. The results of the statistical analysis of Independent t-Test at a 95% confidence level showed a non-significant difference ($p = 0.079$).

Table 1. Distribution of Characteristic Respondent

Characteristics of Respondent	Case		Control		p-Value
	n	%	n	%	
Age (Year)					0,770 ^{a)}
- 16 - 18	1	3,3	0	0	
- 19 - 29	13	43,3	7	23,3	
- 30 - 49	14	46,7	15	50,0	
- 50 - 64	1	3,3	8	26,7	
- ≥ 65	1	3,3	0	0	
Education					0,147 ^{b)}
- Elementary	12	40	19	63,3	
- Junior High School	11	36,7	5	16,7	
- Senior High School	7	23,3	6	20	
Work					0,143 ^{b)}
- Housewife	8	26,7	15	50	
- Seller	2	6,7	2	6,7	
- Laborer	12	40	6	20	
- Entrepreneur	8	26,7	7	23,3	
Income					0,079 ^{a)}
- Low	23	76,7	14	46,7	
- High	7	23,3	16	53,3	
Members					0,095 ^{a)}
- 2 - 4	26	86,7	23	76,7	
- > 4	4	13,3	7	23,3	

Information : a) *Independent t-Test* b) *Mann Whitney*

The results showed that the achievement of consumption of several foodstuff groups in the case and control respondents was below the standard of adequacy except in the grains and legumes. The achievement of animal food consumption in the case group was 20.80 grams (13.8%) compared to the control of 31.0 grams (20.7%). Case and control groups have achieved the same low consumption of animal food sufficiency standards of 150 grams.

The results of the statistical analysis of Independent t-Test at a 95% confidence level showed a significant difference ($p = 0,000$) between the case

and control groups. The achievement of vegetable and fruit consumption in the case group was 75.20 grams (30.0%) compared to the control group of 79.0 grams (31.6%). Case and control groups have achieved the same low consumption of the standard of 250 grams of vegetables and fruits. The results of statistical analysis of Independent t-Test at a 95% confidence level showed a significant difference ($p = 0.036$) between case groups and weight control and the achievement of food consumption per day is presented in Table 2.

Table 2. Weight and Achievement of Food Consumption Per Day

Foodstuffs Group	Standart* (gram)	Case		Control		p-Value
		Rill Consumptio/ Day (gram)	Percent of Consumption (%)	Rill Consumptio/ Day (gram)	Percent of Consumption (%)	
Grains	300	320,30	106,70	321,30	107,10	0,341
Tubes	100	25,00	25,00	22,00	22,00	0,271
Meat and equivalent	150	20,80	13,80	31,00	20,70	0,000
Oil and Fat	25	2,31	9,20	2,49	9,90	0,492
Oily Fruit	10	1,40	14,00	2,59	25,90	0,127
Nuts	35	94,20	269,10	125,60	358,80	0,052
Sugar	30	13,20	44,00	14,70	49,00	0,509
Vegetables and Fruits	250	75,20	30,00	79,00	31,60	0,036

*: Hardinsyah, et al (2001)

The results showed that consumption patterns between case and control for the low to very low categories were 93.3% and 50.0% respectively. The results of statistical analysis of Independent t-Test at a 95% confidence level showed a significant difference ($p = 0.006$) between case and control presented in Table 3.

Table 3. Distribution of Consumption Pattern

Consumption Pattern	Case		Control		p-Value
	n	%	n	%	
Very Low	18	60,0	10	33,3	0,006
Low	10	33,3	5	16,7	
Medium	2	6,7	7	23,3	
High	0	0	5	16,7	
Very High	0	0	3	10	
Total	30	100	30	100	

The results of research on energy and nutrient consumption, most of the average consumption of energy and nutrients in the case is lower than the control. Case and control groups have the same average consumption low as the standard of sufficiency. The results of the statistical analysis of Independent T-Test at a 95% confidence level showed a significant difference ($p = 0.000$) in consumption of fat and vitamin B6 ($p = 0.015$) between case and control. Furthermore, showing the insignificant differences in energy, protein, carbohydrate, vitamin C, Fe and Zn consumption in the case and control groups as presented in Table 4.

Table 4. Consumption Nutrient of Responden

Nutrient	Standart ^{*)}	Case			Control			p-Value
		Mean	±	SD	Mean	±	SD	
Energy (Kalori)	2150	1140,4	±	247,3	1569,4	±	296,3	0,348
Protein (gram)	80,6	32,7	±	7,8	46,48	±	10,49	0,426
CHO (gram)	322,5	270,6	±	77,5	494,5	±	86,9	0,472
Fat (gram)	59,7	70,0	±	13,3	76,6	±	7,16	0,000*
Vitamin B6 (mg)	1,3	0,55	±	0,11	0,98	±	0,19	0,015*
Vitamin C (mg)	75	7,15	±	8,18	19,34	±	12,1	0,123
Fe (mg)	18	4,18	±	1,34	5,02	±	1,69	0,158
Zn (mg)	11	4,14	±	1,01	4,61	±	1,00	0,278

*) Russell dan Malone (2009)

The results showed that the level of energy consumption in case and control were mostly included in the deficit category of 80% and 33.3% respectively. This shows that the level of energy consumption in the control is better than the case. The consumption pattern in very low cases (60%) influences energy consumption level, besides that other sources of food also tend to be less like animal foods which can provide high energy intake value to the needs of respondents. The results of statistical analysis of Independent t-Test at a 95% confidence level showed a significant difference ($p = 0.013$) in the case and control group in Table 5.

Table 5. Distribution responden for Energy Consumption Level

Consumption Level	Case		Control		p-Value
	n	%	n	%	
Normal	6	20,0	20	66,7	0,013
Low Deficit	3	10,0	3	10,0	
Medium Deficit	3	10,0	7	23,3	
Heavy Deficit	18	60,0	0	0	
Total	30	100	30	100	

The results showed that as many as 60% of the case groups had a level of protein consumption in the heavy deficit category. In addition, frequency scores also showed low consumption. It can be shown by the pattern of respondents' consumption of animal dishes as very low. In the control group, 33.3% belonged to low and medium deficits. The results of statistical analysis of

Independent t-Test at a 95% confidence level showed a significant difference ($p = 0,000$) between protein consumption level of case and control. Distribution of respondents based on the level of protein consumption is presented in Table 6.

Table 6. Distribution responden for Protein Consumption Level

Consumption Level	Case		Control		p-Value
	n	%	n	%	
Up To RDA	0	0	2	0	0,000
Normal	5	16,7	18	60,0	
Low Deficit	7	23,3	9	30,0	
Medium Deficit	5	16,7	1	3,3	
Heavy Deficit	13	43,3	0	0	
Total	30	100	30	100	

Most of the case and control groups had low to light weight levels of 66.7% and 16.6% respectively. Furthermore, in the case and control groups there were respondents with normal weight of 33.3% and 60% respectively. The results of Mann Whitney statistical analysis at 95% confidence level showed a significant difference ($p = 0,000$) between case and control groups. Distribution of respondents based on nutritional status is presented in Table 7.

Table 7. Distribution of Nutritional Status

Nutritional Status	Case		Control		p-Value
	n	%	n	%	
BMI<17,0	5	16,7	1	3,3	0,000
BMI 17,0 – 18,4	15	50,0	4	13,3	
BMI 18,5 – 25,0	10	33,3	18	60,0	
BMI 25,1 – 27,0	0	0	4	13,3	
BMI > 27,0	0	0	3	10,0	
Total	30	100	30	100	

IV. DISCUSSION

Most respondents with case and control groups have the same characteristics. The level of education of the majority of respondents in the case and control groups is elementary. Knowledge is formed more in the

teaching and learning process in schools. This indicates that respondents' knowledge between cases and controls is still lacking and not in line with the national program, namely compulsory education for 9 years, meaning that knowledge will increase in respondents with higher levels of education. The level of education generally relates to knowledge and awareness in behaving in a healthy life. According to Sediaoetama (2010) the higher the education, the greater the opportunity to gain wider knowledge [13].

The main types of work in the majority of case groups are workers, among others, construction workers and factory workers so that the income earned is not always fixed so that it falls into the category of poor families. State that non-permanent income will affect access to quality of meeting household food needs. Reseach area is an industrial center in District of Malang, including the embroidery industry, rattan handicrafts, brick, cigarettes and small household industries scattered in each village.

Direct contact from case groups who work as laborers will have the potential to transmit bacteria, besides that bacteria will spread if TB patients are not equipped with mouth covers. According to Ruswanto (2012) contact with TB patients is one of the risk factors for the incidence of tuberculosis [10]. The working atmosphere in very dense industrial land will have a great chance of transmission. According to Misnadiarly and Sunarno (2009), industrial employment is closely related to exposure to TB bacteria that have high population levels, the risk of airborne transmission [14].

Consumption Pattern and Energy and Nutrient Consumption Level

The pattern of respondents' consumption in the low to very low categories between case and control groups is influenced by various factors. Factors affecting consumption patterns include employment, because most of the work of case groups is workers who have low income and are not fixed so that in fulfilling consumption will be less. This causes the consumption of animal food groups and vegetable fruit groups between cases and controls to be below the adequacy standard. Besides that, environmental factors in the study area can also influence consumption patterns. The foodstuffs that are most commonly found and consumed by cases and controls are the grains and nuts. According to Suhardjo (1989), population food consumption patterns are indeed influenced by various factors such as eating habits, food availability, pleasure, social culture, religion, economic and environmental levels [15].

According to Allicia (2010), the lack of variety in food consumption will cause a decrease in the nutritional quality of food consumption that has an impact on health. Adequate nutritional consumption for the number, type and frequency will rarely experience a disturbance in the metabolic processes of energy and nutrients to suffer from infectious diseases and degenerative diseases [16]. According to Widajanti (2009), consumption of nutrients that are not fulfilled within three months will easily experience malnutrition until infection is easy to occur [17].

The consumption pattern of respondents in the very low category will affect the level of consumption between cases and controls. The level of energy consumption in the case group is classified as deficit at mild to severe

levels. This is because respondents' energy consumption is below the standard of sufficiency. Energy is not only obtained from staple foods which are a source of carbohydrates, but animal food can also contribute to higher energy. This has not been fulfilled so that the consumption level in the case group becomes deficit. According to Suandi (2004), energy is needed to support growth and physical activity, muscle activity, and to repair tissue damage [18].

Lack of energy in the body will also affect other nutrients. The level of protein consumption in the case group is mostly in the deficit category. This is shown in the pattern of respondents' consumption of animal dishes below the standard of sufficiency. Meat side dish is a high-protein food ingredient, animal food ingredients are a good source of protein (quantity and quality). Besides that, animal foods have high protein bioavailability in the body. According to Purnasari (2009), the incidence of infection in low energy and protein intake will easily experience deficiencies in Fe and other micronutrients, because consumption of foodstuffs that contain many other micronutrients is widely available in foods with high energy and protein content [19].

Nutritional Status

Optimal nutritional status will be achieved if the balance between the intake of nutrients and the body's need for nutrients is met so as to achieve the body's resistance. Nutritional status of most cases included in the body weight is low to mild to severe. This is due to the intake of energy and protein consumption in case groups that are below the standard of sufficiency. According to Arisman (2004) nutritional conditions are less associated

with lack of energy and protein intake [20].

The ability to meet the lack of intake in the case group in the household environment is influenced by several factors including the economy, which is shown in the income level of most respondents classified as poor so that the ability of households to fulfill consumption related to food availability will experience a deficit. Food deficit availability is also influenced by infection factors according to Kartika and Jahari (2003) that infectious diseases can reduce the appetite of the sufferer so that it will slowly experience weight loss in nutritional status with a deficit category. Infectious diseases will be more susceptible to nutritional status with deficit categories [21].

V. CONCLUSION

The conclusions of the study : 1) the characteristics of respondents in the case and control groups were relatively the same, 2) the achievement of the weight of the case group consumption in the standard-based category was relatively lower compared to the control group, however most of the case and control consumption patterns were in the low to very low categories, 3) The level of energy and protein consumption in the control group is relatively higher than in the case. However, most levels of energy and protein consumption in the case and control groups were in the mild to severe deficit category. 4) Nutritional status in the case group was mostly included in the category of underweight to mild to severe level when compared to the control group which was mostly normal.

The research suggestion is that further research on Integrated Interventions in TB patients is needed in the form of education about food

consumption patterns in low socioeconomic status and Supplementary Feeding Program (PMT) in the form of energy-intensive foods and supplementation of micronutrients (Fe, Vitamin C, B6 and Zn).

REFERENCES

- [1] Ditjen PP & PL Kemenkes RI. 2011. *Strategi Nasional Pengendalian TB Indonesia 2010-2014*.
- [2] Ditjen PP & PL Kemenkes RI. 2012. *Laporan Situasi Terkini Perkembangan TBC di Indonesia Januari-Desember 2012*.
- [3] Suparman, Hardinsyah, Clara M Kusharto, dkk. 2011. *Efek Pemberian Suplemen Sinbiotik dan Zat Gizi Mikro (Vitamin A dan C) Terhadap Status Gizi Penderita TBC Paru Orang Dewasa Yang Mengalami Kekurangan Energi Kronik*. Jurnal Gizi Indonesia, Vol 31 (1) Hal 32-42.
- [4] Wildan, Y., dkk. 2008. *Hubungan Sosial Ekonomi Dengan Angka Kejadian TB Paru BTA Positif di Puskesmas Sedati*. Buletin Penelitian RSU Dr Soetomo Vol 10 (2), Hal 74-80.
- [5] Adriani, M dan Bambang W. 2012. *Pengantar Gizi Masyarakat*. Jakarta : Penerbit Kencana.
- [6] Priswanti dan M Sulchan. 2004. *Hubungan Ketersediaan Pangan Keluarga dan Tingkat Konsumsi Energi Protein, Asam Folat, Vitamin B12 Dengan Kejadian KEK dan Anemia pada Ibu Hamil*. Universitas Diponegoro. Semarang.
- [7] Siswanto, Annasari Mustafa, Nur Aeni. 2006. *Hubungan Tingkat Konsumsi Energi dan Protein, Status Gizi, Sanitasi Lingkungan Dengan Terjadinya Penyakit TB Paru di Puskesmas Pulo Merak Kecamatan Pulo Merak, Kota Cilegon*.
- [8] Anderson, S. 2012. *Patofisiologi dan Konsep Klinis Proses-Proses Penyakit*. Jakarta : Penerbit Buku Kedokteran EGC.
- [9] Nursanti, I. 2002. *Faktor-faktor Risiko Terjadinya TB Paru Pada Umur 15 Tahun ke Atas di Kota Jambi*. Tesis. Universitas Diponegoro. Semarang.
- [10] Ruswanto, B., Nurjazuli. Mursid Raharjo. 2012. *Analisis Spasial Sebaran Kasus TBC Paru Ditinjau Dari Faktor Lingkungan Dalam dan Luar Rumah di Kabupaten Pekalongan*. Jurnal Kes Lingkungan Indonesia Vol 11 No 1/April 2012, Hal 22 – 28.

- [11] Rusnoto, P.R., dan Ari Udiono. 2007. *Faktor-Faktor Yang Berhubungan Dengan Kejadian TB Paru Pada Usia Dewasa*. Tesis. Universitas Diponegoro. Semarang.
- [12] Khan, S., et al. 2012. *Effect of Dietary Counselling On The Nutritional Status Of Tuberculosis Patients*. *Jurnal Agriculture Sarhad.*, Vol 28, No 2, 2012. Hal 303 – 307.
- [13] Sediaoetama, A.D. 2010. *Ilmu Gizi*. Jakarta: PT. Dian Rakyat.
- [14] Misnadiarly dan Sunarno. 2009. *Tuberkulosis Paru dan Analisis Faktor-Faktor Yang Mempengaruhi Tingginya Angka Kejadiannya di Indonesia Tahun 2007*. *Buletin Penelitian Kesehatan Supplement*. Hal 56 – 63.
- [15] Suhardjo. 1989. *Sosio Budaya Gizi*. Bogor : Pusat Antar Universitas Pangan dan Gizi Institut Pertanian Bogor
- [16] Alicia, A. 2010. *Konsumsi Kalsium dan Pola Makan Terhadap Kejadian Obesitas Remaja di SMPN 1 dan SMPN 3 Malang*. Skripsi. Universitas Brawijaya. Malang.
- [17] Widajanti, L. 2009. *Survei Konsumsi Gizi*. Semarang : Badan Penerbit Universitas Diponegoro.
- [18] Suandi, K.G. 2004. *Tumbuh Kembang Remaja dan Permasalahannya*. Jakarta : CV Agung Seto.
- [19] Arisman, D. 2004. *Gizi dalam Daur Kehidupan*. Jakarta : Penerbit Buku Kedokteran EGC.