RESEARCH
www.commprac.com
ISSN 1462 2815

THE IMPACT OF LOST TO FOLLOW UP EVENTS ON TUBERCULOSIS PATIENTS IN MEDAN CITY IN 2023

Dame Evalina Simangunsong [1], Desy Apsari [2] and Marlisa [3]

[1, 2, 3] Poltekkes Kementerian Kesehatan, Medan, Indonesia.
[1]Email: dameevalinas8@gmail.com

DOI: 10.5281/zenodo.10532058

Abstract

Tuberculosis cases in Indonesia are the second highest after India in 2022, this situation has increased compared to the previous year (2021) after India and China. There are an estimated 969,000 TB cases in Indonesia (one person every 33 seconds). This figure is up 17% from 2020, namely 824,000 cases. The incidence of TB cases in Indonesia is 354 per 100,000 population. The high number of cases will affect the prevention and control budget burden for the government and the productivity of sufferers will be low, social interaction will be limited, the risk of transmission will be high, resulting in cases becoming larger and more difficult to control. Multidrug resistant tuberculosis (MDR-TB) as a result of low levels of compliance with taking medication is a factor that results in the emergence of cases of multidrug resistance to anti-TB drugs which give rise to stronger types of TB germs. The results obtained showed that the variables that were more dominant in influencing the incidence of increasing pulmonary TB cases in the city of Medan were duration of treatment, employment status and contact with sufferers in the same household. The modeling obtained can be formulated using the following equation: TB cases = -0.353 + 2.911 (duration of treatment) – 0.959 (employment status) + 1.601 (contact with sufferers in the same household). It is recommended that efforts to overcome the transmission of pulmonary TB be carried out with the Family Approach Healthy Indonesia Program (PISPK), a program to achieve family health status in Indonesia through the integration of PISPK with community health care (PERKESMAS) through home visits through the role of trained cadres.

Keywords: Tuberculosis; Lost To Follow Up; Monitoring; Medication Adherence.

1. INTRODUCTION

Tuberculosis (TB) is a direct infectious disease caused by bacteria mycobacterium tuberculosis. These bacteria can spread into the air if TB patients speak,spitting, coughing or sneezing, so it is very easily transmitted to people who arearound the patient. It is estimated that within 1 year a TB patient can Transmit the disease to 10 to 15 people around him. This is what makes TB is still the world's attention today. even the WHO states that TB is a global humanitarian emergency. Tuberculosis is 1 in 10 causes of death world's highest of a single infectious agent, above Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) (1) . Although the strategy is Directly Observed Treatment Short Course (DOTS) has been shown to be very effective for TB control, but The burden of TB disease in the community is still very high.

Pusdatin data (2018) states that globally in 2016 there were 10.4 million incidence cases of tuberculosis (CI 8.8 million – 12, million) which is equivalent to 120 cases per 100,000 population.The five countries with the highest incidence of cases are India, Indonesia, China, the Philippines, and Pakistan. Indonesia is currently a TB endemic country, estimated in 2018 There are about 845,000 Indonesians infected with TB and this figure is estimated continues to increase every year. This condition is what causes Indonesia became the country with the third highest TB cases in the world after India and China. The problem of TB in Indonesia is currently exacerbated by the

accompanying cases, namely TB with HIV (Human immunodefiency virus) and drug resistant (2).

Multidrug resistant tuberculosis (MDR-TB) is a case of tuberculosis caused by Mycobacterium tuberculosis is minimally resistant to rifampicin and isoniazid together, with or without another first-line antituberculosis drug (OAT) (3). One factor associated with the incidence of MDR-TB is interrupted or inappropriate treatment with DOTS standards resulting in the emergence of cases of multi-immunity to anti-drug drugs TB which gives rise to stronger types of TB germs. Previous research states that the risk factor for MDR-TB is that the motivation for casein in taking medication is quite low andnon-compliance of TB patients in treatment (4). Low adherence rate to taking medication is a risk factor for MDR, out of 27 TB patients who were declared MDR 23 Among them (85.18%) are not compliant in taking medication (5).

Problems

How are the determinants of the incidence of lost to follow up Pulmonary TB patients in Medan City.

Purpose

1. Identify the determinants of the incidence of lost to follow up Pulmonary TB patients in Medan City to Identify the main factors
2. Design an application model for monitoring medication adherence in pulmonary TB patients in cities Terrain.

2. METHOD

Research is carried out in several stages which include literature study, analysis needs, application design, application implementation, application testing and analysis and conclusion.

The initial stage is carried out to identify the problem to be researched, continued with the setting of research goals and objectives. At this stage it is carried out through the process Read research articles and journals relevant to research and surveys introduction to obtain supporting data at health facilities, namely Special Hospitals Lung, North Sumatra Province.

Types of analytical observational research through an explanatory study approach to identification of factors associated with lost to follow up in TB patients. The target of the study is TB patients who have been and or who are still Run treatment programs at health facilities or puskesmas with criteria willing to be a participant in research and have experienced delays in taking TB drugs.

Research data sources are primary data collected through interviews using questionnaires on TB patients regarding patient characteristics and factors-Factors associated with non-adherence to taking medication include forgetting taking medication, limited access to health care, disease complications and effects In addition to the use of anti-tuberculosis drugs. Secondary data collected through Institutions such as hospitals and Community Health Center (Puskesmas) are used as supporting data in Application design.

Analysis of factors associated with lost to follow-up in TB patients carried out univariately and bivariately. Univariate analysis is performed to see proportion of factors lost to follow up. Bivariate analysis is done to see the meaning Statistically using the chi square test and the meaning of the substance by looking at the value odds ratio. The results of the analysis will be presented in the form of tables, graphs and narratives.

3. RESULTS AND DISCUSSION

A. Overview of Medan City Research Location

Medan City has an area of 26,510 hectares (265.10 km²) or 3.6% of the total area of North Sumatra. When compared to other cities/regencies, Medan has a relatively small area with a relatively large population. Geographically, the city of Medan is located at 3° 30' - 3° 43' North Latitude and 98° 35' - 98° 44' East Longitude. For this reason, the topography of Medan tends to slope to the north and is at an altitude of 2.5 - 37.5 meters above sea level. Regional Boundaries, administratively, the boundaries of Medan are the North bordering the Strait of Malacca, the East, South, West bordering Deli Serdang (1).

B. Characteristics of Pulmonary TB patients based on the length of diagnosis

The results of data processing by cross-tabulation, characteristics of patients with long diagnosis of pulmonary TB on data collection carried out on patients with 210 patients with Pulmonary TB in seven (7) Puskesmas in the city of Medan, showed the following results:

Table 1: Characteristics of Pulmonary TB Patients based on Duration in TB Diagnosis In the city of Medan Year 2023

No.	Characteristics	Long Diagnosis of TB			
		< 6 month		< 6 month	
		N	%	N	%
1.	Gender				
	- Male	66	55,9	46	50
	- Female	52	44,1	46	50
2.	Age				
	- < 20	6	5,1	7	7,6
	- 20 – 40	50	42,4	32	34,8
	- > 40	62	52,5	53	57,6
3.	Level of education				
	- Primary Shcool	12	10.1	24	26
	- First level secondary school	21	17,8	18	19,6
	- High School	55	46,6	39	42,4
	- Academies/colleges	30	25,4	11	12
4.	Occupation				
	- Civil servants	5	4,3	1	1,1
	- Private Employees	15	13	5	5,7
	- Self employed	38	33	23	26,1
	- Employee	13	11,3	7	8,0
	- Un employed	45	38,4	52	59,1
5	Families With Pulmonary TB				
	- Yes	58	60	39	40
	- Not	51	45,1	62	54,9
6	- Concomitant diseases				
	- Yes	53	54,1	45	45,9
	- Not	42	37,5	70	62,5

7	Vitamin Consumption				
	- Yes	62	71,3	25	28,7
	- Not	53	43,1	70	56,9
8	Duration of treatment				
	- ≤ 1 tahun	57	38	93	62
	- >1 tahun	21	35	39	65

The table above shows that the most patients with Pulmonary TB are men, there are as many as 112 people, of whom as many as 66 (55.9%) have a long diagnosis of < 6 months while 46 people (50%) with a long diagnosis of ≥ 6 months. The age of most patients with Pulmonary TB was found, at the age of > 40 years, there were 115 people of whom 62 people (52.5%) with a long diagnosis of < 6 months to 53 (57.6%) with a long diagnosis of ≥ 6 months.

The level of education possessed by patients with Pulmonary TB, the most is with the level of high school education, there are 94 people including 55 people (46.6%) with a long diagnosis of < 6 months and 39 people (42.4%) with a long diagnosis of ≥ 6 months. The types of jobs owned by pulmonary TB sufferers, the most with non-working status, include 45 people (38.4%) with a long diagnosis of < 6 months and 52 people (59.1%) with a long diagnosis of ≥ 6 months.

C. Modeling Analysis Results

The results of modeling analysis on factors that affect the incidence of cases of TB patients more than 6 months, can be seen in the table below:

Table 2: The Effect of Characteristics of Pulmonary TB Patients with Long Time in TB Diagnosis in Medan City in 2023

Variabel	B	P value	Exp(B)
Occupation	-1,021	0,003*	0.360
Families with Pulmonary TB	1,583	0,016*	4,872
- Concomitant diseases	0,208	0,565	1,231
Vitamin Consumption	0.255	0,452	1,290
Lama Berobat	2,936	0.000*	18,838

*) significance 95% (p=0,05)

In the first stage of modeling analysis, it is known that of the 6 (six) factors that are significantly determinants of cases of TB patients more than 6 months are employment status (p value: 0.003), family members who have suffered from TB (p.value: 0.016) and the duration of the patient following treatment (p value: 0.000).

The next stage of analysis is to analyze 3 (three) significant risk factors and obtain the following results:

Table 3: The Effect of Duration of Treatment, Work and Family of TB with Duration in TB Diagnosis in Medan City in 2023

Variable	B	P value	Exp(B)
Duration of treatment	2,911	0,000	18,368
Occupation	-,959	0,004	0.383
Families with Pulmonary TB	1,601	0,015	4,959

The table above shows that the variables that are more influential on the duration of TB diagnosis are the variables of length of treatment with p value = 0.000 and value B (β) = 18.368; followed by the job variable with p value = 0.004 and B value (β) = 0.383 and family with TB, with p value = 0.015 and B value (β) = 4.959 so that it can

be concluded that the three variables are more dominant in influencing the incidence of loss to follow up of pulmonary Tb patients in the city of Medan.

DISCUSSION

The results of this study show that men have a greater risk of developing Pulmonary TB, allegedly due to higher movement and working hours than women. Moreover, the habit of smoking and drinking alcohol can reduce immunity, making men more susceptible to tuberculosis germs. Very significant effect in increasing the risk of tuberculosis germs.

The level of education describes a person's behavior in terms of health. The lower the education, the less science in the field of health, both directly and indirectly can affect the physical, biological and social environment that is detrimental to health and ultimately affects the high cases of existing TB and the regularity of taking drugs. A high level of education can affect the level of compliance of TB patients in undergoing treatment with OAT, conversely, the lower a person's level of knowledge, the lower the tendency of TB patients to comply in carrying out treatment with OAT. Likewise, with the onset of TB – MDR (Tuberculosis-Multi Drug Resistant), people who work must have high mobility and busyness, so patients tend to be non-compliant in carrying out treatment using OAT.

The type of work has a socioeconomic relationship because it is related to the income obtained. Patients with Pulmonary TB who work and have good socioeconomics will try to immediately seek treatment and good nutritional intake, otherwise someone with a low economy tends to find it difficult to get treatment and lack of nutritional intake. Families that have sufficient income or middle to upper economy, relatively have better behavior in maintaining health.

The large number of family members living in the same house is a risk factor for TB transmission. Where the denser the house, the transfer of diseases, especially infectious diseases through the air will be easier and faster, if there are family members suffering from TB who accidentally cough. Mycobacterium tuberculosis bacteria will be in the air for approximately 2 hours as a factor of disease transmission in one member who has not been infected with mycobacterial tuberculosis germs.

Settlements and infrastructure mentioned that people's space needs are calculated based on basic human activities in the house. The space requirement per person is 9 m2 with the calculation of the average height of the ceiling is 2.80 meters. For the bedroom a minimum of 2 people are required. Bedrooms should not be occupied by > 2 people, except for husbands, wives and children under two years old (Presidential Regulation of the Republic of Indonesia, 2021). TB germs are transmitted through droplet nuclei that are coughed or sneezed by someone to others, and can transmit to 10-15 people around him, especially children.

Household contact with patients with pulmonary TB is indirectly related to the dose response, because the longer a person comes into contact with people with pulmonary TB, the more exposed to pulmonary TB germs and will pose a risk of developing pulmonary TB disease. The incubation period of TB germs starting from the entry of germs to the occurrence of infection is estimated at 6 months to 2 years (Ministry of Health, 2022). Every positive BTA transmits to 10-15 other people, so the chance of contact to contract TB is 17% (WHO, 2018).

The presence of household contact affects the process of transmission to other family members. In general, transmission occurs in rooms where droplets (sputum splashes) exist for a long time. Bacteria present in droplets can survive several hours in dark and humid conditions (Presidential Regulation of the Republic of Indonesia, 2021). History of household contact is a trigger for the transmission of Mycobacterium tuberculosis bacteria to family members living in the same house (Nurrahmawati et al., 2023).

The increasing number of occupants will affect oxygen levels in the room, there needs to be a natural and artificial air exchange cycle that can maintain the freshness of the room itself (Presidential Regulation of the Republic of Indonesia, 2021). The results of this study showed that the length of time the disease was diagnosed by patients with pulmonary TB in the city of Medan, amounting to 33.7% was only diagnosed after more than 6 months. This can show that the patient is not aware of the symptoms he is experiencing so that the risk of exposure to anyone who is around the patient will be infected. Ministry of Health (2022), the delay of patients to get treatment will be able to cause too many germs and spread to other organs. Among them, TB can occur in the bones, which can cause (Ministry of Health, 2022).

The duration of treatment undertaken by the patient can show that the patient is withdrawing drugs. This is likely to happen because people infected with TB must take medication with a duration of 6 to 9 months. The duration of consumption of this drug can cause sufferers to stop eating drugs, for various reasons ranging from feeling healthy to bored. In addition, the long duration of treatment also requires patients to have routine control in order to get drugs, while not all patients have easy access to go to health services. WHO (2022), recommends a new drug-sensitive TB treatment guide that is shorter in duration, namely a 4-month treatment guide using a combination of isoniazid, rifapentine, moxifloxacin and pyrazinamide or 2HPMZ/2HPM.

The intensive and advanced phases each have a duration of 2 months and are given to patients with criteria aged 12 years and over with evidence of drug-sensitive pulmonary tuberculosis (World Health Organization, 2022). Treatment with a shorter duration is a new step that can minimize the incidence of drug withdrawal, so as to reduce the risk of increasing new numbers related to the incidence of resistant / immune TB germs in the future. Drug Swallowing Supervisor / PMO is a supporting factor to help the recovery process of TB patients.

The results of this study found that 88.6% of pulmonary TB patients were supervised by family in the supervision of taking medication. Non-adherence to treatment results in TB sufferers can relapse with germs that are resistant to Anti-Tuberculosis Drugs (OAT), thus becoming a source of transmission of resistant germs and failing treatment. This results in TB retreatment is more difficult, treatment time is longer and more funds are spent (Putri, 2020).

Indonesia developed this strategy in the Drug Taking Supervisory (PMO) program, a form of supervision of adherence to taking drugs according to the program for TB sufferers. Drug Taking Supervisors who monitor and remind people with pulmonary TB to take medication regularly (Ministry of Health, 2022). Supervision of Drug Swallowing has the task of accompanying (checking into the Health service unit), ensuring (patients take their medicine regularly until declared cured), Monitoring (monitoring TB treatment and treatment side effects), Motivating (providing psychosocial support to patients), Counseling (providing TB counseling to TB patients,

families and the general public), encouraging (to re-examine sputum) (Ministry of Health of the Republic of Indonesia, 2022); (Presidential Regulation of the Republic of Indonesia, 2021).

Education that must be done by PMO is: Educate that Pulmonary TB is caused by germs and break the stigma of society that says Pulmonary TB is a hereditary disease; Pulmonary TB can be cured by taking regular medication; Educate on the side effects of taking Pulmonary TB drugs; Educate on how to administer treatment; Educating the importance of supervising the taking of Pulmonary TB drugs (Presidential Regulation of the Republic of Indonesia, 2021).

Medication supervisors have an important role to play in improving treatment success. The family as a Supervisor of Taking Medicine has a very important responsibility for the compliance and successful treatment of Pulmonary TB patients (Sukirawati, 2020). Pulmonary TB disease is very prone to transmission to the people closest to the patient such as the family.

The risk of transmission of Pulmonary TB, especially in toddlers and the elderly who have a lower immune system, also in HIV sufferers who experience immune system damage in the body. Risk factors for suspected pulmonary tuberculosis are people who live under the same roof with BTA positive pulmonary TB patients. The intensity of contact is the amount of time people with BTA positive pulmonary TB interact with respondents who are around them (family and neighbors) on a daily basis.

The length of interaction can be seen from spending time with sufferers in the form of watching TV together, cooking together, doing homework together, conversing together for a long time without using a mask, eating and sleeping together in one room for more than 8 hours / day.

Several things that can be done in the family in an effort to prevent transmission of pulmonary TB, including keeping family members away from patients when coughing, avoiding transmission through the patient's sputum, opening the window of the house for air circulation and always drying the mattress of patients with pulmonary TB (Nurrahmawati et al., 2023) :(Sukirawati, 2020).

In preventing transmission of family Pulmonary TB is very important, because one of the duties of the family is to care for sick family members and prevent transmission to healthy family members. History of comorbidities found in this study, as much as 31% dominated by Diabetes Mellitus, followed by Hypertension, Gastritis and HIV.

The same thing was also found in the results of the Balitbangkes survey study (2022), M. tuberculosis often attacks the lungs, but can also infect organs outside the lungs and cause extrapulmonary TB disease consisting of various types that can accompany or accompany pulmonary TB disease.

Another comorbidity and the dominant disease is Diabetes Mellitus (DM). This is strongly related to blood glucose levels, namely DM sufferers whose blood sugar (glucose) levels are uncontrolled (equal to or greater than 200 Mg / dl). It is easier for bacteria to grow and develop, than DM sufferers who have their blood sugar controlled and people who are non-DM.

The presence of comorbidities such as DM and HIV can be the cause of drug resistance in TB patients. Impaired drug absorption due to suffering from comorbidities such as Diabetes Mellitus (DM) tends to occur. TB patients with comorbidities such as

HIV-TB co-infection and Diabetes Mellitus (DM) are one of the factors that cause MDR TB. Research shows that there are several other factors that can cause MDR-TB, including TB patients suffering from comorbidities such as DM (Anita &; Sari, 2022).

High blood sugar levels can cause impaired OAT absorption so that the effectiveness of OAT decreases which has an impact on the occurrence of OAT resistance. The condition of double disease TB-DM can reduce the immunity of TB patients so that it can increase cases of MDR-TB.

TB patients who have a history of diabetes mellitus have a 5,635 times greater risk of becoming MDR-TB than TB patients who do not have a history of diabetes mellitus (Hidayathillah &; Wahyuni, 2018). In DM patients suspected phagocytosis and bactericidal activity of neutropil is disturbed, the number of T lymphocytes decreases. The host's defenses against mycobacterium infection decrease. Comorbid DM associated with MDR TB (WHO, 2018); (Imam et al., 2023).

DM patients who have TB infection will be difficult to control blood sugar levels. DM increases the risk of TB 1.5 to 7.8 times compared to non-DM (Anita &; Sari, 2022).

In advanced modeling analysis, the regression line equation is obtained as follows:

TB cases = -0.353 + 2.911 (duration of treatment) – 0.959 (employment status) + 1.601 (household contact).

These results show that the duration / duration of treatment undertaken by TB patients proved to be a major factor in the length of time a person suffers from TB with an odd ratio (OR) value = 18.368. The duration of a person's treatment can be suspected because the patient is not compliant while undergoing the treatment process so that there is the potential for Drug Resistant Tuberculosis (RO-TB) or Multi Drug Resistant Tuberculosis (MDR TB).

The employment status factor from the analysis day shows that the value of OR = 0.383 or < 1, so it can be concluded that a working person tends to be faster to do the examination so that the treatment process can be done earlier, the condition can be suspected because working people tend to choose to seek treatment immediately so that they recover faster and can move much better, social interaction in the work environment can motivate someone to be able to do their job effectively, without harm to himself or his environment.

The third factor that affects the length of time a person suffers from TB is contact with household members who have had TB with an OR value = 4.959, indicating that contact with fellow TB sufferers in the same household is a risk factor so it needs to be limited because at that time, the risk of transmission is very high and TB transmission is not only through breathing.

Patients who live in the same house have the potential to be in the same room for a long time so that it is possible to be contaminated by sputum splashes, especially when talking.

4. CONCLUSION AND RECOMENDATION

The results found that the variables that more dominantly influenced the incidence of increasing cases of Pulmonary TB in the city of Medan were the duration of treatment, employment status and contact with housemates against the increase in tuberculosis cases in the city of Medan.

Modeling can be formulated by the following equation: Tuberculosis cases = -0.353 + 2.911 (duration of treatment) – 0.959 (employment status) + 1.601 (contact with household patients). It is recommended to design an intervention that can change the duration of treatment to be timely by modifying the method or strategy of treatment and increasing the participation of Drug Taking Supervisors (PMO), limiting contact with household patients by maximizing family participation in the prevention and control of Pulmonary TB transmission, with the Family Approach Healthy Indonesia Program (PISPK) is a program to achieve family health status in Indonesia through the integration of PISPK with Public health care (Perkesmas) through home visits through the role of trained cadres.

References

1) WHO. Global Tuberculosis 2018 Report [Internet]. Geneva; 2018. Available from: https://apps.who.int/iris/handle/10665/274453

2) Pusat Data dan Informasi Kesehatan. Infodatin, Pusat data dan Informasi Kemenkes RI [Internet]. Jakarta; 2018. Available from:

https://pusdatin.kemkes.go.id/resources/download/pusdatin/infodatin/infodatin-tuberkulosis-2018.pdf

3) WHO. WHO treatment guidelines for drug resistant tuberculosis. In: treatment guidelines for drugresistant tuberculosis. Geneva: WHO; 2016. p. 58.

4) Dwi Sarwani SR , Sri Nurlaela IZA. Faktor Risiko Multidrug Resistant Tuberculosis (MDR-TB). J Kesehat Masy [Internet]. 2012;8(1):60–6. Available from:

http://journal.unnes.ac.id/nju/index.php/kemas

5) Wartono CDAM. Faktor-faktor yang mempengaruhi terjadinya Multi Drug Resistance Tuberkulosis (MDR-TB). J Biomedika dan Kesehat. 2018;1(1).2013

6) Peraturan Menteri Kesehatan Republik Indonesia Nomor 13 TAHUN 2013. Indonesia; 2013 p. 130.

7) Dyan Kunthi Nugrahaeni USM. Analisis Penyebab Resistensi Obat Antituberkulosis. 15Jurnal Kesehat Masy [Internet]. 2015;11(1):8–15. Available from:

https://journal.unnes.ac.id/nju/index.php/kemas/article/view/3341/3562

8) Mulyanto H. Hubungan Lima Indikator Perilaku Hidup Bersih Dansehat Dengan Tuberkulosis Multidrug Resistant. J Berk Epidemiol[Internet]. Available from:

https://e- journal.unair.ac.id/JBE/article/view/1302

9) Iis Nurhayati1, Titis Kurniawan WM. Perilaku Pencegahan Penularan dan Faktor-Faktor yang Melatarbelakanginya pada Pasien Tuberculosis Multidrugs Resistance (TB MDR). J Keperawatan Padjajaran [Internet]. 2013;3(3):166–75. Available from:

http://jkp.fkep.unpad.ac.id/index.php/jkp/article/view/118

10) Manik Parmelia, Dyah Pradnyaparamita Duarsa KAKS. Faktor Yang Berhubungan Dengan Kejadian Putus Obat Pada Pasien Tuberkulosis Paru Di Puskesmas Kota Denpasar. J Med UDAYANA [Internet]. 2019;8(9). Available from:

https://ojs.unud.ac.id/index.php/eum/article/view/53069

11) Isak Jurun Hans Tukayo, Sri Hardyanti MSM. Faktor Yang Mempengaruhi Kepatuhan Minum Obat Anti Tuberkulosis Pada Pasien Tuberkulosis Paru Di Puskesmas Waena. J Keperawatan Trop PAPUA Internet]. 2020;3(1). Available from: http://jurnalpoltekkesjayapura.com/index.php/jktp

12) Putri MH. Kepatuhan minum obat, tuberculosis, efek samping, sikap, dukungan keluarga.Wellness Heal Mag. 2020;2(1).

13) Widiyanto A. Hubungan Kepatuhan Minum Obat Dengan Kesembuhan Pasien Tuberkulosis Paru Bta Positif Di Puskesmas Delanggu Kabupaten Klaten. J Terpadu Ilmu Kesehatan, Vol 6, No 1,Mei 2016, hlm 01-117. 2016;6(1):7–12.

14) Agi Ginanjar, Adang Suherman, Tite Juliantine YH. Jurnal Pendidikan Jasmani dan Olahraga. Pendidik Jasm Olahraga [Internet]. 2018;3(1):122–8. Available from:

http://ejournal.upi.edu/index.php/penjas/index

15) Panggayuh PL, Winarno ME. Faktor Yang Berhubungan dengan Keberhasilan Pengobatan Tuberkulosis Paru di Rumah Sakit Umum Karsa Husada Batu. Sport Sci Heal.2019;1(1):28–38.

16) Sundari J. Sistem Informasi Pelayanan Puskesmas Berbasis Web. IJSE – Indones J Softw Eng [Internet]. 2016;2(1):44–9. Available from:

https://ejournal.bsi.ac.id/ejurnal/index.php/ijse/article/view/665

17) Dedy Hidayat Kusuma, Moh. Nur Shodiq, Dianni Yusuf LS. Si-Bidan: Sistem Informasi Kesehatan Ibu dan Anak Si-Bidan: Maternal and Child Health Information System. INTENSIF [Internet]. 2019;3(1). Available from:http://ojs.unpkediri.ac.id/index.php/intensif.

18) Ferdy Wahyurianto, Issa Arwani AAS. Pembangunan Aplikasi Informasi Kesehatan Masyarakat Kota Malang Berbasis Mobile Native Android. J Pengemb Teknol Inf dan Ilmu Komput. 2019;3(1):416–25