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by Maulana Yusuf Alkandahri

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MEASUREMENT OF ADHERENCE LEVEL OF PULMONARY TUBERCULOSIS DRUGS USE IN PATIENTS IN THE PRIMARY HEALTH CENTERS IN KARAWANG REGENCY, WEST JAVA, INDONESIA, USING MMAS INSTRUMENT

ABSTRACT

Aims: This study aims to determine the level of drug adherence in patients with pulmonary tuberculosis at the Cilamaya Kulon Primary Health Center area, Karawang Regency, West Java, Indonesia.

Study Design: The measurement of adherence level was carried out using the MMAS (*Morisky Medication Adherence Scale*) instrument.

Place and Duration of Study: This study was conducted at Cilamaya Kulon Primary Health Center area, specifically in Bayur Lor and Pasirukem Primary Health Centers, Karawang Regency, West Java, Indonesia, from July to September 2021.

Methodology: A cross-sectional design with a purposive sampling data collection method was used. Furthermore, the subjects were pulmonary TB patients from the Bayur Lor and Pasirukem Primary Health Centers, Karawang Regency. The instrument used was the MMAS questionnaire sheet, and data analysis was performed using SPSS (version 22.0) and continued with statistical tests using the *chi-square* test.

Results: The results showed there was no significant relationship ($p > 0.05$) between age, gender, educational status, employment status, income level, smoking status, duration of treatment, drugs side effects, medication supervision, and patient motivation for drugs adherence in the Cilamaya Kulon Primary Health Center area. Furthermore, the level of medication adherence of pulmonary TB patients at this Primary Health Center area was high with a value of 84.13%.

Conclusion: Adherence to medication in pulmonary TB patients was not influenced by age, gender, educational status, employment status, income level, smoking status, duration of treatment, drug side effects, medication supervision, and patient motivation. Therefore, the adherence level is included in the high category.

Keywords: Pulmonary tuberculosis, Adherence level, Primary Health Center, MMAS.

1. INTRODUCTION

Tuberculosis (TB) is an infectious disease of the lung tissue and is caused by *Mycobacterium tuberculosis*. Pulmonary TB can affect people of all ages with different clinical presentations ranging from mild to severe symptoms. Until now, no single country in the world is free from TB, and the number of associated morbidity and mortality is quite high [1]. According to the WHO Global Tuberculosis Report 2021 data, it is estimated that 9.9 million people are confirmed to have TB in 2020, which is equivalent to 127 cases per 100,000 population, and an estimated 1.3 million deaths globally. This disease can be found in anyone, regardless of age or gender. In fact, adult men accounted for 56% of all TB cases in 2020, while women accounted for 33% and children 11%. Indonesia is the third country with the highest TB burden in the world after India (26%) and China (8.5%), with a total of 8.4% of the total number of cases globally [2]. Based on data from the Indonesian Ministry of Health in 2020, as many as 845,000 TB cases were reported with 13,947 deaths. Furthermore, West Java is reported to be the highest province contributing to TB with 123,021 cases [3].

Based on data from the Karawang City Health Office in 2021, there are currently 2,329 cases of pulmonary TB spread across 50 health centers, including Bayur Lor Health Center and Pasirukem with 32 and 31 cases, respectively [4]. The magnitude and extent of the problems caused by TB require all parties to be committed and work together for its control. The losses caused by this disease are large, not only from the health aspect but also from the socio-economic aspects. Hence, adherence to anti-tuberculosis drugs is required to achieve successful treatment. Also, adherence is important for healthy living and is influenced by behavioral factors. Treatment as prescribed by a doctor will be effective as long as the patient obeys instructions [5]. Therefore, this study aims to determine the level of anti-tuberculosis drug adherence in patients with pulmonary TB in the Cilamaya Kulon Primary Health Center area, specifically in Bayur Lor and Pasirukem Primary Health Centers, Karawang Regency, West Java, Indonesia.

2. MATERIALS AND METHODS

2.1 Subject and Instrument

This study used a cross-sectional design with a purposive sampling data collection method. The subjects were pulmonary TB patients from the Cilamaya Kulon Primary Health Center area, specifically in Bayur Lor and Pasirukem Primary Health Centers, Karawang Regency, West Java, Indonesia. The instrument used was the MMAS (*Morisky Medication Adherence Scale*) questionnaire. Before the study, ethical approval was obtained from the Research Ethics Committee, Faculty of Medicine, Padjadjaran University, and written permission were obtained from the head of the Primary Health Center area.

2.2 Data Collection

Data collection was carried out from July to September 2021. The sample was 63 patients who were diagnosed with pulmonary tuberculosis and recorded in their medical record, received anti-tuberculosis drugs, redeemed prescription drugs at the Primary Health Center, and met the inclusion and exclusion criteria.

a. Inclusion criteria:

- Patients who are willing to be respondents.
- Patients who received a prescription for pulmonary TB from a doctor.
- Patients with complete medical records.
- Patients aged 15-64 years (adults), and > 64 years (geriatrics).

b. Exclusion criteria:

- Patient dies.
- Patients with special needs (difficulty speaking or unable to hear).
- Patients who are pregnant.
- Extra-pulmonary patients.
- Patients with incomplete medical records.

The respondents filled out an informed consent as evidence of willingness to participate in this study, respondent information sheets, and MMAS questionnaires according to their current conditions and perceptions.

2.3 Data Analysis

Data analysis was performed using SPSS (version 22.0) and continued with statistical tests using the *chi-square*. The dependent variable was patient adherence to the use of anti-tuberculosis drugs expressed in percentage. Meanwhile, the independent variables were patient characteristics related to the level of adherence consisting of age, gender, educational status, employment status, income level, patient motivation, smoking status, and duration of pulmonary TB treatment. A descriptive analysis was then used to explore the characteristics of pulmonary TB patients.

3. RESULTS AND DISCUSSION

The respondents' characteristics showed the proportion of male pulmonary TB patients (52.38%) was higher than females (47.62%). This is in accordance with Marçôa et al, which showed that pulmonary TB was more common in men than women [6]. Furthermore, the majority of the patients were in the 15-64 years age group, and their educational level was considered to be relatively low. Education is one of the external factors that affect a person's health where those with a high educational background usually act more preventively on a disease. Therefore, the higher a person's educational level, the better the acceptance of information about treatment, and the better the adherence [7].

Table 1. Relationship of characteristics with medication adherence in pulmonary TB patients

Characteristics	Adherence with taking medication				p
	Adhere		Disobey		
	Frequency	%	Frequency	%	
Age					
15 - 64 years	51	96.23	9	90	0.969
> 65 years	2	3.77	1	10	
Gender					
Male	28	52.83	5	50	1.00
Female	25	47.17	5	50	
Educational Status					
No school	2	3.77	2	20	0.540
Elementary school	33	62.26	5	50	
Junior high school	11	20.75	1	10	
Senior high school	6	11.33	2	20	
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Income Level					
< 1,000,000	47	88.68	10	10	0.595
> 3,000,000	6	11.32	0	0	
Smoking Status					
Yes	10	18.88	1	10	0.823
No	43	81.12	9	90	

Treatment Duration					
> 6 months	41	77.36	7	70	0.923
< 6 months	12	22.64	3	30	
Drug Side Effects					
Yes	3	5.66	0	0	1.00
No	50	94.34	10	100	
Medication Supervisor					
Yes	52	98.11	10	100	1.00
No	1	1.89	0	0	
Patient Motivation					
Good	37	69.81	6	60	1.00
Bad	16	30.19	4	40	

This study showed there was no significant relationship ($p > 0.05$) between age, gender, educational status, employment status, income level, smoking status, duration of treatment, drug side effects, medication supervision, and motivation for drug adherence in patients with pulmonary TB in the Cilamaya Kulon Primary Health Center area (Table 1). This finding showed there are no factors that affect medication adherence in pulmonary TB patients.

Table 2. Distribution of medication adherence levels in pulmonary TB patients (n=63)

Level of adherence to taking medication	Frequency	%
Adhere	53	84,13
Disobey	10	15,87

This study also showed the level of medication adherence in patients with pulmonary TB at the Cilamaya Kulon Primary Health Center area was included in the high category with a value of 84.13% (Table 2). This is because counseling related to the importance of drug adherence was often carried out, hence patients understand the importance of adherence in their treatment process. This adherence will aid their complete and prompt recovery. Some of the outreach and education activities to the community that are often carried out include home care, personal hygiene, regular consultations with the medical team, and others. These activities can be seen in Figure 1 below.



Figure 1. Counseling and education activities for pulmonary TB patients.

One of the most influential factors in patient recovery is medication adherence. This is defined as the behavior to take medicine according to the type, dose, mode of administration, time interval, and the number of days as prescribed by the doctor [8, 9, 10]. Pulmonary TB patients who take their medication regularly can reduce the risk for treatment failure by 3.76 times compared to those who do not regularly take medication [11].

4. CONCLUSION

This study showed the adherence level of pulmonary TB patients in the Cilamaya Kulon Primary Health Center area is high with a value of 84.13%. Also, there was no significant relationship ($p > 0.05$) between age, gender, educational status, employment status, income level, smoking status, duration of treatment, drug side effects, medication supervision, and motivation for adherence in pulmonary tuberculosis patients.

ACKNOWLEDGMENTS

The authors are grateful to all the patients who participated in this study.

ETHICAL APPROVAL

Approval from Research Ethics Committee, Faculty of Medicine, Padjadjaran University (No. 858/UN6.KEP/EC/2021).

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Thank you very much for submitting your valuable paper to our journal. We have started the editorial processing of the manuscript with the following details

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Journal Name:	Journal of Pharmaceutical Research International
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Minor REVISION comments	There were some words joined together. E g issuedis instead of issued is. Needed to work on.	
Optional/General comments	Good research area with recent references. Satisfactory especially with the statistical analysis.	

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	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
Compulsory REVISION comments	<p>The study site is not clear. Is BayurLor and Pasirukem Primary health centers part of the Cilamaya Kulon Primary health center? If not, perhaps you could just mention the specific primary health centers in which the study took place.</p> <p>“Tuberculosis (TB) is an infectious disease of the lung tissue and is caused by <i>Mycobacterium tuberculosis</i>”. This sentence could insinuate that Tuberculosis only affects the lung parenchyma hence missing out on the extra-pulmonary form of Tuberculosis.</p> <p>The number of associated morbidity and mortality is quite high-: It would be good to state the Tuberculosis morbidity and mortality globally, in your country and region as well as the tuberculosis prevalence in which the research is being carried out. This will help the reader understand the magnitude of Tuberculosis burden in your region.</p> <p>This disease can be found in anyone, regardless of age or gender. – This is repeated in the 2nd sentence of introduction.</p> <p>“There are currently 2,329 cases of pulmonary TB spread across 50 health centers, including BayurLor Health Center and Pasirukem with 32 and 31 cases, respectively” – Kindly indicate the duration when the above cases were notified in the various center.</p> <p>It would be good to mention whether the Pulmonary TB patients were bacteriologically confirmed or clinically diagnosed. This would help us understand the extent of the adherence concern in bid of community transmission of TB.</p> <p>More flesh needs to be added on the introduction section; for example, are there any global and in-country policies or directives addressing TB adherence ?</p> <p>In material and methods section, it would be good to expound more on the study site for the reader to understand your region better. For example:</p> <ul style="list-style-type: none"> • Location of the study in relation to your country; is it an urban or rural region? • What is the catchment population of the region • What is the TB prevalence of the region vis-a vis the country's TB prevalence? • Is there any co-morbidity in your region that fuel TB? HIV infection? If 	

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	<p>yes, what is the co-infection rate?</p> <ul style="list-style-type: none"> • Are there any parameters that would affect the TB adherence in your region? <p>Exclusion criteria:</p> <ul style="list-style-type: none"> • Were extra pulmonary patients excluded from the study ? If yes, it would be good to put them under exclusion criteria. • Patients with incomplete medical records. • Lost to follow up patients – were there any patients that got lost to follow up ? <p>It would be prudent to separate the result section from the discussion section to make the two sections distinct.</p> <p>The manuscript lacked a section of strengths and limitations of the study, it would be beneficial to add them in the discussion section.</p> <p>Except reference no.6 on the result/discussion section there are no other studies that have been referenced in relation to the study findings. It would be prudent to compare and document the study findings with other array of similar studies conducted globally.</p>	
<p>Minor REVISION comments</p>	<p>A number of grammatical errors have been noted, kindly do a spell check.</p> <p>In the abstract section the type of study design is not spelt out under the sub-heading of “study design”</p> <p>In table 2: Perhaps you could use non-adherent instead of disobey.</p> <p>The conclusion section has a mix of present and past tense. It is important to maintain it in past tense.</p>	
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We are pleased to inform that peer review process and editorial review process have been completed for your following manuscript

Manuscript no: 2021/JPRI/77471

Title: "Measurement of Adherence Level of Pulmonary Tuberculosis Drugs use in Patients in the Primaryhealth Centers in Karawang Regency, West Java, Indonesia, using Mmas Instrument"

Author(s): Maya Arfania, Dedy Frianto, Diany Astuti, EbtaNarasukma Anggraeny, Triani Kurniawati c, Robby Alivian and Maulana Yusuf Alkandahri

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Measurement of Adherence Level of Pulmonary Tuberculosis Drugs use in Patients in the Primary Health Centers in Karawang Regency, West Java, Indonesia, using MMAS Instrument

Maya Arfania ^a, Dedy Frianto ^a, Diany Astuti ^a, Ebta Narasukma Anggraeny ^b,
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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study aims to determine the level of drug adherence in patients with pulmonary tuberculosis at the Cilamaya Kulon Primary Health Center area, Karawang Regency, West Java, Indonesia.

Study Design: The measurement of adherence level was carried out using the MMAS (*Morisky Medication Adherence Scale*) instrument.

Place and Duration of Study: This study was conducted at Cilamaya Kulon Primary Health Center area, specifically in Bayur Lor and Pasirukem Primary Health Centers, Karawang Regency, West Java, Indonesia, from July to September 2021.

Methodology: A cross-sectional design with a purposive sampling data collection method was used. Furthermore, the subjects were pulmonary TB patients from the Bayur Lor and Pasirukem Primary Health Centers, Karawang Regency. The instrument used was the MMAS questionnaire

sheet, and data analysis was performed using SPSS (version 22.0) and continued with statistical tests using the *chi-square* test.

Results: The results showed there was no significant relationship ($p>0.05$) between age, gender, educational status, employment status, income level, smoking status, duration of treatment, drugs side effects, medication supervision, and patient motivation for drugs adherence in the Cilamaya Kulon Primary Health Center area. Furthermore, the level of medication adherence of pulmonary TB patients at this Primary Health Center area was high with a value of 84.13%.

Conclusion: Adherence to medication in pulmonary TB patients was not influenced by age, gender, educational status, employment status, income level, smoking status, duration of treatment, drug side effects, medication supervision, and patient motivation. Therefore, the adherence level is included in the high category.

Keywords: Pulmonary tuberculosis; adherence level; primary health center; MMAS.

1. INTRODUCTION

Tuberculosis (TB) is an infectious disease of the lung tissue and is caused by *Mycobacterium tuberculosis*. Pulmonary TB can affect people of all ages with different clinical presentations ranging from mild to severe symptoms. Until now, no single country in the world is free from TB, and the number of associated morbidity and mortality is quite high [1]. According to the WHO Global Tuberculosis Report 2021 data, it is estimated that 9.9 million people are confirmed to have TB in 2020, which is equivalent to 127 cases per 100,000 population, and an estimated 1.3 million deaths globally. This disease can be found in anyone, regardless of age or gender. In fact, adult men accounted for 56% of all TB cases in 2020, while women accounted for 33% and children 11%. Indonesia is the third country with the highest TB burden in the world after India (26%) and China (8.5%), with a total of 8.4% of the total number of cases globally [2]. Based on data from the Indonesian Ministry of Health in 2020, as many as 845,000 TB cases were reported with 13,947 deaths. Furthermore, West Java is reported to be the highest province contributing to TB with 123,021 cases [3].

Based on data from the Karawang City Health Office in 2021, there are currently 2,329 cases of pulmonary TB spread across 50 health centers, including Bayur Lor and Pasirukem Primary Health Centers with 32 and 31 cases, respectively [4]. The magnitude and extent of the problems caused by TB require all parties to be committed and work together for its control. The losses caused by this disease are large, not only from the health aspect but also from the socio-economic aspects. Hence, adherence to anti-tuberculosis drugs is required to achieve successful treatment. Also, adherence is important for healthy living and is influenced by

behavioral factors. Treatment as prescribed by a doctor will be effective as long as the patient obeys instructions [5]. Therefore, this study aims to determine the level of anti-tuberculosis drug adherence in patients with pulmonary TB in the Cilamaya Kulon Primary Health Center area, specifically in Bayur Lor and Pasirukem Primary Health Centers, Karawang Regency, West Java, Indonesia.

2. MATERIALS AND METHODS

2.1 Subject and Instrument

This study used a cross-sectional design with a purposive sampling data collection method. The subjects were pulmonary TB patients from the Cilamaya Kulon Primary Health Center area, specifically in Bayur Lor and Pasirukem Primary Health Centers, Karawang Regency, West Java, Indonesia. The instrument used was the MMAS (*Morisky Medication Adherence Scale*) questionnaire. Before the study, ethical approval was obtained from the Research Ethics Committee, Faculty of Medicine, Padjadjaran University, and written permission were obtained from the head of the Primary Health Center area.

2.2 Data Collection

Data collection was carried out from July to September 2021. The sample was 63 patients who were diagnosed with pulmonary tuberculosis and recorded in their medical record, received anti-tuberculosis drugs, redeemed prescription drugs at the Primary Health Center, and met the inclusion and exclusion criteria.

2.2.1 Inclusion criteria

- Patients who are willing to be respondents.

- Patients who received a prescription for pulmonary TB from a doctor.
- Patients with complete medical records.
- Patients aged 15-64 years (adults), and > 64 years (geriatrics).

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Data analysis was performed using SPSS (version 22.0) and continued with statistical tests using the *chi-square*. The dependent variable was patient adherence to the use of anti-tuberculosis drugs expressed in percentage. Meanwhile, the independent variables were patient characteristics related to the level of adherence consisting of age, gender, educational status, employment status, income level, patient motivation, smoking status, and duration of pulmonary TB treatment. A descriptive analysis was then used to explore the characteristics of pulmonary TB patients.

3. RESULTS AND DISCUSSION

The respondents' characteristics showed the proportion of male pulmonary TB patients (52.38%) was higher than females (47.62%).

This is in accordance with Marçôa et al, which showed that pulmonary TB was more common in men than women [6]. Furthermore, the majority of the patients were in the 15-64 years age group, and their educational level was considered to be relatively low. Education is one of the external factors that affect a person's health where those with a high educational background usually act more preventively on a disease. Therefore, the higher a person's educational level, the better the acceptance of information about treatment, and the better the adherence [7].

This study showed there was no significant relationship ($p>0.05$) between age, gender, educational status, employment status, income level, smoking status, duration of treatment, drug side effects, medication supervision, and motivation for drug adherence in patients with pulmonary TB in the Cilamaya Kulon Primary Health Center area (Table 1). This finding showed there are no factors that affect medication adherence in pulmonary TB patients.

This study also showed the level of medication adherence in patients with pulmonary TB at the Cilamaya Kulon Primary Health Center area was included in the high category with a value of 84.13% (Table 2). This is because counseling related to the importance of drug adherence was often carried out, hence patients understand the importance of adherence in their treatment process. This adherence will aid their complete and prompt recovery. Some of the outreach and education activities to the community that are often carried out include home care, personal hygiene, regular consultations with the medical team, and others. These activities can be seen in Fig. 1 below.

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< 1,000,000	47	88.68	10	10	0.595
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Smoking Status					
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No	43	81.12	9	90	
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Drug Side Effects					
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No	50	94.34	10	100	
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Fig. 1. Counseling and education activities for pulmonary TB patients

One of the most influential factors in patient recovery is medication adherence. This is defined as the behavior to take medicine according to the type, dose, mode of administration, time interval, and the number of days as prescribed by the doctor [8,9,10]. Pulmonary TB patients who take their medication regularly can reduce the risk for treatment failure by 3.76 times compared to those who do not regularly take medication [11].

4. CONCLUSION

This study showed the adherence level of pulmonary TB patients in the Cilamaya Kulon Primary Health Center area is high with a value of 84.13%. Also, there was no significant relationship ($p>0.05$) between age, gender, educational status, employment status, income level, smoking status, duration of treatment, drug side effects, medication supervision, and motivation for adherence in pulmonary tuberculosis patients.

DISCLAIMER

The products employed in this study are routinely and often used in our field of study and country. There is no conflict of interest between the writers and makers of the products because we do not plan to use them as a means of pursuing legal action, but rather to further knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Approval from Research Ethics Committee, Faculty of Medicine, Padjadjaran University (No. 858/UN6.KEP/EC/2021).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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