

MODERATING FAMILY RESILIENCE IN FAMILY STRESS ON THE MEDICATION COMPLIANCE OF PULMONARY TB PATIENTS IN SURABAYA CITY

DHIAN SATYA RACHMAWATI

Faculty of Public Health, Airlangga University, Indonesia.

*Corresponding Author Email: dhian.satya.rachmawati-2017@fkm.unair.ac.id

NURSALAM NURSALAM

Faculty of Nursing, Airlangga University, Indonesia. Email: nursalam@fkp.unair.ac.id

MUHAMMAD AMIN

Faculty of Medicine, Airlangga University, Indonesia. Email: muh.amin@fk.unair.ac.id

RACHMAT HARGONO

Faculty of Public health, Airlangga University, Indonesia. Email: rachmat.hargono@fkm.unair.ac.id

A.V. SRI SUHARDININGSIH

Sekolah Tinggi Ilmu Kesehatan Hang Tuah Surabaya, Indonesia. Email: aves0705@yahoo.co.id

DWI PRIYANTINI

Sekolah Tinggi Ilmu Kesehatan Hang Tuah, Surabaya, Indonesia.

Email: dwipriyantini@stikeshangtuah-sby.ac.id

MAYA AYU RIESTIYOWATI

Sekolah Tinggi Ilmu Kesehatan Hang Tuah Surabaya, Indonesia. Email: maya.ayu@stikeshangtuah-sby.ac.id

Abstract

Background: The case detection rate (CDR) of TB cases was predicted to exceed 70 percent in 2020, while the success rate (SR) of TB treatment was above 85 percent. Pulmonary tuberculosis can also cause disruption to vitality of life, a person's social functioning, emotional state, and mental health in general. Stress and anxiety may have a significant effect on the self-concept and self-acceptance of pulmonary TB patients, which directly correlate with their happiness, well-being and life satisfaction. This study used a family approach by assessing family resilience as a moderating variable of family stress on pulmonary TB treatment compliance. It is hoped that the family is able to independently carry out the function of health care with the final outcome of the compliance of family members with pulmonary TB with their treatment program. **Materials and Methods:** The population in this study was families whose family members were diagnosed as pulmonary TB patients during the data collection period in the health center working area in Surabaya City. Samples were taken from some families who met the inclusion and exclusion criteria. The method used in this research as Moderating Structural Equation Modeling using smart Partial Least Square (PLS). **Results:** The results of the study using the Partial Least Square (PLS) approach indicate that the moderating variable (family resilience) on family stress on the medication compliance of pulmonary TB patients is a fit model based on the criteria for the value of R^2 , Q^2 . Family resilience as a variable that moderates family stress has an effect that strengthens compliance to medication for patients with pulmonary TB. Individual Factors of Pulmonary TB Patients, Treatment Category Factors, Family Factors, Social Factors, Family Stressor Factors, Individual Stress Factors, Individual Belief Factors, Family Stress

Factors, and Moderating Family Resilience on Family Stress provide a relevant prediction that very accurate on treatment compliance of patients with pulmonary TB by 90.7 percent. The dominant factor influencing medication compliance of pulmonary TB patients is the moderating factor of Family Resilience on Family Stress. Furthermore, for family stress and Individual Belief, the dominant factor was Individual Stress. While Individual Stress is significantly influenced by individual factors of pulmonary TB patients. **Conclusions:** Family resilience as a variable that moderates family stress has an effect that strengthens compliance to medication for patients with pulmonary TB. Individual Factors of Pulmonary TB Patients, Treatment Category Factors, Family Factors, Social Factors, Family Stressor Factors, Individual Stress Factors, Individual Belief Factors, Family Stress Factors, and Moderating Family Resilience on Family Stress provide a relevant prediction that very accurate on treatment compliance of patients with pulmonary TB. The dominant factor influencing medication compliance of pulmonary TB patients is the moderating factor of Family Resilience on Family Stress. Furthermore, for family stress and Individual Belief, the dominant factor was Individual Stress. While Individual Stress is significantly influenced by individual factors of pulmonary TB patients.

Keywords: Individual belief, Family stress, Family resilience, Medication compliance

Introduction

TB is the ninth leading cause of death in the world. An estimated 10.4 million people fell ill with TB in 2016, of which 90% were adults, 65% were men, 10% were people living with HIV (74% in Africa) and 56% were in five countries: India, Indonesia, China, Philippines and Pakistan (WHO, 2017). The TB Case Detection Rate (CDR) in Indonesia in 2020 was predicted to be >70%, while the TB Success Rate (SR) was >85%. However, Indonesia is still one of the ten leading countries in terms of TB cases in the world. The number of TB sufferers in Indonesia ranks third in the world after India and China (WHO, 2017). In the WHO Global Tuberculosis Report (2017), the incidence of tuberculosis in Indonesia in 2015 was around 395 cases/100,000 population and the mortality rate was 40/100,000 population (HIV patients with tuberculosis were not counted) and 10/100,000 people living with HIV with tuberculosis.

Surabaya is the second largest city in Indonesia. In 2015, the number of new cases of pulmonary TB disease in the city of Surabaya was 2,330 patients, the AFB+ cure rate was 70.43% and the success rate was 79.21% (Dinkes, 2015) [2]. According to data from the Surabaya City Health Office in 2016, the total number of tuberculosis patients in the Surabaya city area was 5389 patients, of which 3421 patients were reported by 63 health centers and 1968 patients were reported by 33 public and private hospitals in the Surabaya City area.

In the SITT online data source version 10.04, from 5389 patients, 358 (6.64%) patients reported Drop Out (DO), 2016 (37.41%) patients recovered, 2657 (49.3%) completed treatment, 188 (3.5%) died, 116 (2.15%) patients moved and 54 (1%) patients reported failure. Based on reports from 63 public health centers in the Surabaya City Region, the North Surabaya area has the highest number of TB patients. Pulmonary tuberculosis can also cause disruption to vitality of life, a person's social functioning, emotional state, and mental health in general. Stress and anxiety may have a significant effect on the self-

concept and self-acceptance of pulmonary TB patients, which directly correlate with their happiness, well-being and life satisfaction.

Family plays an important role in taking care and providing support and is crucial in maintaining the optimum level of patient's health in dealing with their disease (Samal, 2016)[3]. Other studies also stated that the majority of pulmonary TB patients have no social support system and display poor compliance (Prakash Chandra, Sangita Singh, 2011)[4]. Good support and care from the family must be taken into account in giving special attention to the daily routine of pulmonary TB patients (Kaulagekar-nagarkar, Aarti, 2012) [5], especially when it comes to medication compliance. The problems faced by pulmonary TB patients will have an impact on the family as a whole; family unpreparedness, poor family knowledge of TB, as well as discrimination impact are some factors that need to be taken into account.

Previous studies have shown that in chronic conditions, family caregivers often feel unprepared to provide care, have inadequate knowledge about the delivery of appropriate care and receive little to no guidance from formal health care providers. In TB cases, there is often a misunderstanding between the family and the community that leads to disease discrimination (Kaulagekar-nagarkar et al., 2012)[5]. Discrimination perceived at the beginning of diagnosis is one of the causes of depression (Li-Yun Lee, Heng-Hsin Tung, Shu-Ching Chen, 2017).

Families of pulmonary tuberculosis patients are often faced with stress-inducing conditions, including psychosocial problems such as loss of hope, sleep disturbances or rest disorders (Prakash Chandra, Sangita Singh, 2011)[4]. Depression is also often observed among TB patients (Shen et al., 2014)[7]. Families of pulmonary TB sufferers facing a relatively long treatment period coupled with limited information or lack of family knowledge about the disease they are suffering make them not aware of the health problems experienced by the family and as a result they are unable to make the right decisions and provide care and condition the right environment and use health facilities. In such conditions families are unable to carry out health care functions (Friedman, 2010)[8].

The target in this study is the family as a unit that is cared for with one of the family members suffering from pulmonary TB. Health problems in the family are interrelated, where if one member is sick, other family members will also be affected. Moreover, in the case of a family member of a TB patient, every family member has a risk of contracting this Mycobacterium Tuberculosis. The active involvement of families in the care of family members with TB requires special attention. The family as the main unit of society and institutions that concern people's lives, as a group, can cause, prevent, ignore or improve health problems in the group (Friedman, 2010)[8].

The Healthy Indonesia Program was implemented with a family approach, so in this study a family approach was used by measuring Family Resilience with family members suffering from pulmonary TB so that the family was able to independently carry out health care functions with the final result of the compliance of pulmonary TB patients with their treatment program.

Methods related to latent variables are Confirmatory Factor Analysis (CFA) (Hair et al., 2010 [9]; Bollen, 1989 [10]). Otok et al., (2018) [11], Weak physical condition, social economy less prosperous, and the emergence of a degenerative disease that can lead to decreased productivity, thus affecting social life, it is necessary to study the quality-of-life index of elderly global, urban and coastal communities in Surabaya. Deboeck, et al., (2020) [12], examined predictive model values in a SEM model used as the basis for inference and prediction. Otok, et al., (2019) [13] used a non-parametric model structure to estimate the poverty model by meta-analysis.

Azomahou et al., (2010) [14], the data analysis approach if the available information about the regression curve is limited and it is difficult to make assumptions about the form of regression, then the largest part of the information lies in the data pattern, so that to predict the regression curve regression nonparametric whose analysis is not based on a certain distribution.

PLS does not assume the absence of a specific distribution for parameter estimation, hence the parametric technique for testing parameter signification is not required [15]. PLS evaluation model based on prediction measurement that has nonparametric properties. Measurement models or outer models whose reflexive indicators are evaluated with convergent and discriminant validity of their indicators and composite reliability for indicator blocks. While the outer model with formative indicators is evaluated based on its substantive content which is to compare the relative weight size and see the signification of the weight size [15]. Structural model or inner model evaluated by looking at the value for latent R^2 construct response with using stone-geisser size test, Q^2 [16] [17], and also seeing the magnitude of the structural path coefficient of this estimate was evaluated using the t-test statistic obtained from the bootstrapping procedure [18]. Bootstrap to test the research hypothesis through the t test, and bootstrap stops if between the original estimate and the bootstrap estimate has a close value [19].

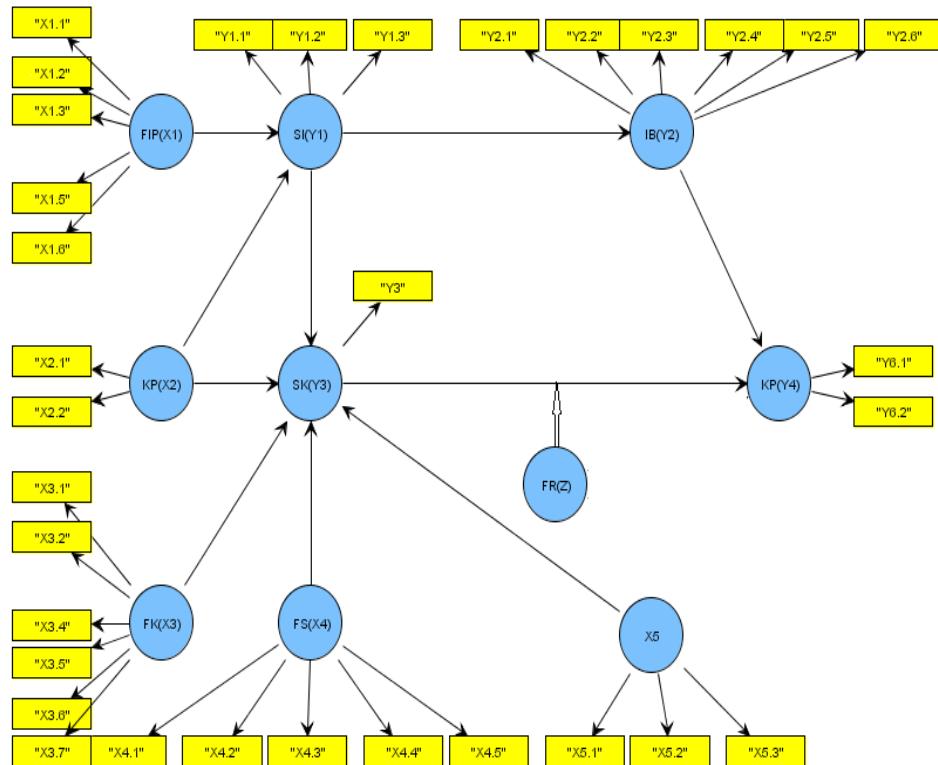
The purpose of this study was to examine Family Resilience as a moderating variable for family stress factors on pulmonary TB treatment compliance. Furthermore, it also examined the effect of individual factors with pulmonary TB patients, treatment categories, family factors, and social factors, family stressors on treatment compliance with pulmonary TB patients through individual stress, individual belief, and family stress.

Research Methodology

The population in this study was families whose family members were diagnosed as pulmonary TB patients during the data collection period in the health center working area in Surabaya City. Samples were taken from some families who met the inclusion and exclusion criteria. The study has obtained the certificate of ethical aptitude from the Health Research Ethics Commission of the Faculty of Nursing of Universitas Airlangga with number: 1750-KEPK

The conceptual model of Medication Compliance is presented as follows:

Figure 1. Conceptual Model of Medication Compliance



The SEM modeling was carried out using Partial Least Square (PLS) with the following steps:

1. Outer Model, including validity tests seen from the factor loading results and reliability tests seen from composite reliability values. The indicator was declared valid if it had a loading factor value > 0.5 and was said to be reliable if the composite reliability value was > 0.7 .
2. Inner model, this test can be assessed from the results of the inner weight value that tests the research hypothesis through the t test on the bootstrap sample and goodness of fit model. The model can be declared to have goodness of fit if it had an R-Square value > 0 and a Q^2 value $= 1 - (1 - R_1^2)(1 - R_2^2)(1 - R_3^2) > 0.35$ gave high accuracy [15] [16] [17]. The outer and inner model coefficients of this estimate are evaluated using the statistical test- t obtained from the bootstrapping procedure [18], and the bootstrap stops if between the original estimate and the bootstrap estimate are nearly the same [19].

The moderating modeling with the interaction method consisted of two stages. The first stage, It was proven that the moderating variable (family resilience) had a significant effect on medication compliance of pulmonary TB patients, while the second stage, if it was proven to have an effect, then the variable (family resilience) was assumed to be a moderating variable, and then PLS modeling was carried out with the “path” scheme [20], involving the moderating variable (family resilience) and interaction variable (family resilience) with Family Stress on the medication compliance of pulmonary TB patients.

Description:

FIP(X1)	: Patient Factors
KP(X2)	: Medication Categories
FK(X3)	: Family Factors
FS(X4)	: Social Factors
X5	: Family Stressor
SI (Y1)	: Individual Stress
IB (Y2)	: Individual Belief
SK (Y3)	: Family Stress
FR (Z)	: Family Resilience
KP (Y6)	: Medication Compliance
•	: latent variable
■	: Indicator
→	: Influence

Results

The measurement model consisted of a validity test and a reliability test. In detail, the validity and reliability of each latent variable are presented in Table 1.

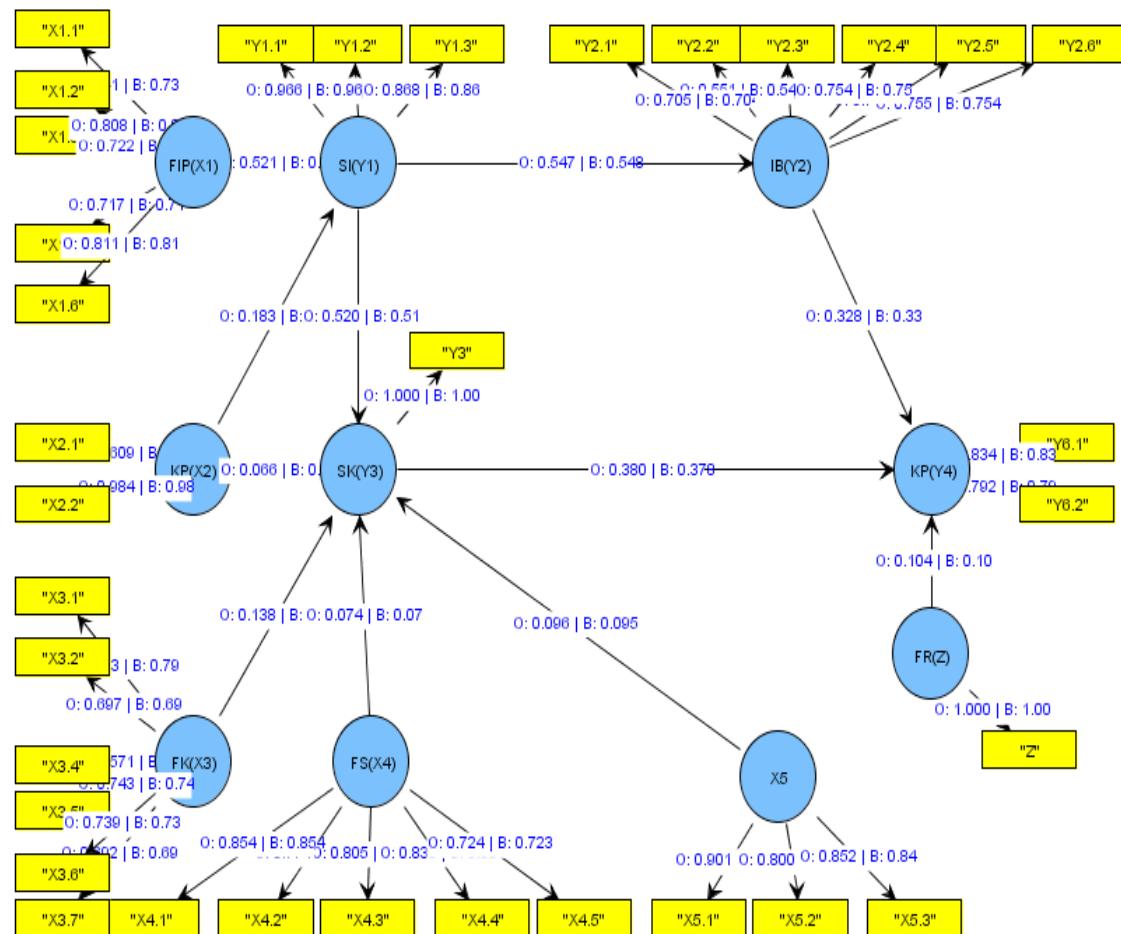
Table 1. Convergent Validity, Discriminant Validity and Reliability of Latent Variable Values

Latent Variable	Indicator	Loading Factor (λ)	Composite Reliability (C-R)	Average variance extracted (AVE)	Root Average variance extracted (AVE)
Individual Factors of Pulmonary TB Patients (FIP(X1))	Age (X1.1)	0.741	0.898	0.579	0.761
	Knowledge (X1.2)	0.808			
	Education (X1.3)	0.722			
	Patient position in family (X1.5)	0.717			
	Personal Motivation (X1.6)	0.811			
Medication Category (KP(X2))	TB Patient Category (X2.1)	0.609	0.793	0.670	0.819
	Treatment side effects (X2.2)	0.984			
Family Factors (FK(X3))	Family Type (X3.1)	0.793	0.868	0.503	0.709
	Family Structure (X3.2)	0.697			
	Able to make the right health action decisions (X3.4)	0.571			
	Able to care for sick family members (X3.5)	0.743			
	Able to maintain healthy home atmosphere/modify environment (X3.6)	0.739			
	Able to use health facilities (X3.7)	0.692			
Social Factors (FS(X4))	Emotional support (X4.1)	0.854	0.898	0.639	0.799
	Appreciation support (X4.2)	0.774			
	Instrumental support (X4.3)	0.805			
	Information support (X4.4)	0.833			
	Stigma of TB (X4.5)	0.724			
Family Stressors (X5)	Loss (X5.1)	0.901	0.888	0.726	0.852
	Disease and Treatment (X5.2)	0.800			
	Tension (X5.3)	0.852			
Individual Stress (SI(Y1))	Depression (Y1.1)	0.966	0.943	0.848	0.921
	Anxiety (Y1.2)	0.925			
	Stress (Y1.3)	0.868			
Individual Belief (IB(Y2))	Perceived Susceptibility (Y2.1)	0.705	0.858	0.504	0.710
	Perceived Severity (Y2.2)	0.551			
	Perceived Barrier (Y2.3)	0.735			
	Perceived Benefit (Y2.4)	0.754			
	Cues to Action (Y2.5)	0.741			
	Self efficacy (Y2.6)	0.755			
Family Stress (SK(Y3))	Family Stress (Y3)	1.000	1.000	1.000	1.000
Family Resilience (FR(Z))	Family Resilience (Y5)	1.000	1.000	1.000	1.000
Medication Compliance of Pulmonary TB Patients(KP(Y6))	Medication Compliance (Y6.1)	0.834	0.796	0.661	0.813
	AFB and RO Examinations (Y6.2)	0.792			

Table 1 shows that latent variables Individual Factors of Pulmonary TB Patients ($FIP(X_1)$), Medication Category ($KP(X_2)$), Family Factors ($FK(X_3)$), Social Factors ($FS(X_4)$), Family Stressors (X_5), Individual Stress ($SI(Y_1)$), Individual Belief ($IB(Y_2)$), Family Stress ($SK(Y_3)$), Family Resilience ($FR(Z)$) and Medication Compliance of Pulmonary TB Patients ($KP(Y_6)$) showed loading factors and C-R values above the cut-off value; thus, they can be said to be valid and reliable. Similarly, the AVE root values indicates that all latent variables meet the assumption of discriminant validity.

Furthermore, the path diagram form of the Treatment Compliance Model for Pulmonary TB Patients ($KP(Y_6)$) stage 1 is presented as follows:

Figure 2. Bootstrap Estimation of the Effect of Individual Factors of Pulmonary TB Patients ($FIP(X_1)$), Medication Category ($KP(X_2)$), Family Factors ($FK(X_3)$), Social Factors ($FS(X_4)$), Family Stressors (X_5) on the Medication Compliance of Pulmonary TB Patients ($KP(Y_6)$) through Individual Stress ($SI(Y_1)$), Individual Belief ($IB(Y_2)$), Family Stress ($SK(Y_3)$) with Family Resilience ($FR(Z)$) as the Stage 1 moderator



The path coefficient test in Figure 2 in detail is presented in the following table:

Table 2. Path Coefficient Result Test of the Medication Compliance Model of Pulmonary TB Patients (KP (Y6)) and Family Resilience (FR (Z)) as the Stage 1 Moderator

	original sample estimate	mean of subsamples	Standard deviation	T-Statistic
Individual Factors of Pulmonary TB Patients (FIP(X1)) → Individual Stress (SI(Y1))	0.495	0.496	0.030	16.566
Medication Category (KP(X2)) → Individual Stress (SI(Y1))	0.209	0.206	0.039	5.392
Medication Category (KP(X2)) → Family Stress (SK(Y3))	0.064	0.064	0.024	2.667
Family Factors (FK(X3)) → Family Stress (SK(Y3))	0.130	0.133	0.032	4.057
Individual Stress (SI(Y1)) → Family Stress (SK(Y3))	0.524	0.519	0.037	14.346
Social Factors (FS(X4)) → Family Stress (SK(Y3))	0.078	0.076	0.028	2.785
Family Stressors (X5) → Family Stress (SK(Y3))	0.100	0.102	0.038	2.641
Individual Stress (SI(Y1)) → Individual Belief (IB(Y2))	0.547	0.549	0.032	17.189
Family Stress (SK(Y3)) → Medication Compliance of Pulmonary TB Patients (KP(Y6))	0.380	0.378	0.028	13.376
Individual Belief (IB(Y2)) → Medication Compliance of Pulmonary TB Patients (KP(Y6))	0.328	0.328	0.027	12.069
Family Resilience (FR(Z)) → Medication Compliance of Pulmonary TB Patients (KP(Y6))	0.104	0.106	0.025	4.100

Table 2 shows the direct effect of the moderating variable Family Resilience (FR (Z)) on Medication Compliance of Pulmonary TB patients. Family Resilience (Z) has a positive and significant effect on Medication Compliance of Pulmonary TB patients. This can be seen from the positive path coefficient of 0.192 with a T-Statistic value of 3.119, which is greater than the t-table of 1.96. Therefore, Family Resilience (Z) has a direct effect on Medication Compliance of Pulmonary TB patients by 0.192, which means that every increase in Family Resilience (Z) will increase Medication Compliance of Pulmonary TB Patients by 0.207. This shows that Family Resilience (Z) is suspected as a moderating variable that strengthens the influence of Family Stress (Y3) on Medication Compliance of Pulmonary TB Patients. Then it proceeded to analysis in the form of path diagrams as presented below:

Figure 3. Bootstrap Estimation of the Effect of Individual Factors of Pulmonary TB Patients (FIP(X1)), Medication Category (KP(X2)), Family Factors (FK(X3)), Social Factors (FS(X4)), Family Stressors (X5) on the Medication Compliance of Pulmonary TB Patients (KP(Y6)) through Individual Stress (SI(Y1)), Individual Belief (IB(Y2)), Family Stress (SK(Y3)) with Family Resilience (FR(Z)) as the Stage 2 moderator

The path coefficient test in Figure 2 in detail is presented in the following table:

Table 2. Path Coefficient Result Test of the Medication Compliance Model of Pulmonary TB Patients (KP (Y6)) and Family Resilience (FR (Z)) as the Stage 2 Moderator

	original sample estimate	mean of subsamples	Standard deviation	T-Statistic
Individual Factors of Pulmonary TB Patients (FIP(X1)) → Individual Stress (SI(Y1))	0.521	0.521	0.030	17.206
Medication Category (KP(X2)) → Individual Stress (SI(Y1))	0.183	0.185	0.038	4.847
Medication Category (KP(X2)) → Family Stress (SK(Y3))	0.066	0.072	0.032	2.046
Family Factors (FK(X3)) → Family Stress (SK(Y3))	0.138	0.136	0.034	4.072
Individual Stress (SI(Y1)) → Family Stress (SK(Y3))	0.520	0.515	0.038	13.656
Social Factors (FS(X4)) → Family Stress (SK(Y3))	0.074	0.073	0.031	2.366
Family Stressors (X5) → Family Stress (SK(Y3))	0.096	0.097	0.042	2.255
Individual Stress (SI(Y1)) → Individual Belief (IB(Y2))	0.547	0.550	0.028	19.670
Family Stress (SK(Y3)) → Medication Compliance of Pulmonary TB Patients (KP(Y6))	0.087	0.103	0.036	2.362
Individual Belief (IB(Y2)) → Medication Compliance of Pulmonary TB Patients (KP(Y6))	0.303	0.305	0.033	9.187
Family Resilience (FR(Z)) → Medication Compliance of Pulmonary TB Patients (KP(Y6))	0.320	0.331	0.057	5.571
Interaction of Family Resilience with Family Stress (FR_SK) → Medication Compliance of Pulmonary TB Patients (KP(Y6))	0.783	0.804	0.104	7.512

The results of testing the complete model above with the SmartPLS program can be assessed from the R-Square Value which describes the goodness-of-fit of a model. The recommended R-Square value is greater than zero. The results of this research data processing using SmartPLS provide an R-square value as shown in Table 4 below:

Table 4. Goodness of fit based R-Square

Variable	R-Square
Individual Factors of Pulmonary TB Patients (FIP(X1)), Medication Category (KP(X2)) → Individual Stress (SI(Y1))	0.410
Medication Category (KP(X2)), Family Factors (FK(X3)), Social Factors (FS(X4)), Family Stressors (X5), Individual Stress (SI(Y1)) → Family Stress (SK(Y3))	0.569
Individual Stress (SI(Y1)) → Individual Belief (IB(Y2))	0.300
Family Resilience (FR(Z)), Individual Belief (IB(Y2)), Family Stress (SK(Y3)), Interaction of Family Resilience and Family Stress (FR_SK) → Medication Compliance of Pulmonary TB Patients (KP(Y4))	0.477

Table 4 describes that the contribution or proportion of the variables Individual Factors of Pulmonary TB Patients (FIP(X1)), Medication Category (KP(X2)) in explaining the

variations around the variable Individual Stress ($SI(Y1)$) was 0.410; the variables Medication Category ($KP(X2)$), Family Factors ($FK(X3)$), Social Factors ($FS(X4)$), Family Stressors ($X5$), Individual Stress ($SI(Y1)$) in explaining the variations around the variable Individual Stress ($SI(Y1)$) was 0.569; the variable Individual Stress ($SI(Y1)$) in explaining the variations around the variable Individual Belief ($IB(Y2)$), Interaction of Family Resilience and Family Stress (FR_SK) in explaining the variationss around the variable Medication Compliance of Pulmonary TB Patients ($KP(Y6)$) was 0.477. All of these R-square values indicate that all R-square values are greater than zero. This means that this research model has met the required Goodness of Fit.

Calculations of the value of Q square from Table 4 obtain the following result:

$$Q^2 = 1 - ((1-0.410)(1-0.569)(1-0.300)(1-0.477)) = 0.907$$

It can be interpreted that the model is able to predict Medication Compliance of Pulmonary TB Patients ($KP(Y4)$) by 90.7%, and 9.3% is explained by other variables outside the model.

From the fit model, each path coefficient can be interpreted. The path coefficients are hypotheses in this study, which can be presented in the following structural equation:

$$SK(Y1) = 0.521 FIP(X1) + 0.183 KP(X2)$$

$$IB(Y2) = 0.547 SK(Y1)$$

$$SK(Y3) = 0.066 KP(X2) + 0.138 FK(X3) + 0.074 FS(X4) + 0.096 X5 + 0.520 SK(Y1)$$

$$KP(Y4) = 0.303 IB(Y2) + 0.087 SK(Y3) + 0.320 FR(Z) + 0.783 (FR_SK)$$

Where:

$FIP(X1)$: Individual Factors of Pulmonary TB Patients

$KP(X2)$: Medication Category

$FK(X3)$: Family Factors

$FS(X4)$: Social Factors

$X5$: Family Stressors

$SK(Y1)$: Individual Stress

$IB(Y2)$: Individual Belief

$SK(Y3)$: Family Stress

$FR(Z)$: Family Resilience

$KP(Y4)$: Medication Compliance of Pulmonary TB Patients

Based on Table 3, the interpretation of each path coefficient is as follows:

- 1) Individual Factors of Pulmonary TB Patients FIP(X1) has a positive and significant effect on Individual Stress SK (Y1). This can be seen from the path coefficient which is positive at 0.521 with a T-Statistic value of 17.206, which is greater than the t-table of 1.96. Thus, Individual Factors of Pulmonary TB Patients FIP(X1) has a direct effect on Individual Stress SK (Y1) of 0.521, which means that every increase in Individual Factors of Pulmonary TB Patients FIP(X1) will increase Individual Stress SK (Y1) by 0.521.
- 2) Medication Category (KP(X2)) has a positive and significant effect on Individual Stress SK (Y1). This can be seen from the path coefficient which is positive at 0.183 with a T-Statistic value of 4.847, which is greater than the t-table of 1.96. Thus, Medication Category (KP(X2)) has a direct effect on Individual Stress SK (Y1) of 0.672, which means that every increase in Medication Category (KP(X2)) will increase Individual Stress SK (Y1) by 0.183.
- 3) Medication Category (KP(X2)) has a positive and significant effect on Family Stress (SK (Y3)). This can be seen from the path coefficient which is positive at 0.066 with a T-Statistic value of 2.046, which is greater than the t-table of 1.96. Thus, Medication Category (KP(X2)) has a direct effect on Family Stress (SK (Y3)) of 0.066, which means that every increase in Medication Category (KP(X2)) will increase Individual Stress SK (Y1) by 0.066.
- 4) Family Factors (FK(X3)) has a positive and significant effect on Family Stress (SK (Y3)). This can be seen from the path coefficient which is positive at 0.138 with a T-Statistic value of 4.072, which is greater than the t-table of 1.96. Thus, Family Factors (FK(X3)) has a direct effect on Family Stress (SK (Y3)) of 0.138, which means that every increase in Family Factors (FK(X3)) will increase Family Stress SK (Y1) by 0.138.
- 5) Individual Stress (SI (Y1)) has a positive and significant effect on Family Stress (SK (Y3)). This can be seen from the path coefficient which is positive at 0.520 with a T-Statistic value of 13.656, which is greater than the t-table of 1.96. Thus, Individual Stress (SI (Y1)) has a direct effect on Family Stress (SK (Y3)) of 0.520, which means that every increase in Individual Stress (SI (Y1)) will increase Family Stress SK (Y1) by 0.520.
- 6) Social Factors (FS(X4)) has a positive and significant effect on Family Stress (SK (Y3)). This can be seen from the path coefficient which is positive at 0.074 with a T-Statistic value of 2.366, which is greater than the t-table of 1.96. Thus, Social Factors (FS(X4)) has a direct effect on Family Stress (SK (Y3)) of 0.074, which means that every increase in Social Factors (FS(X4)) will increase Family Stress SK (Y1) by 0.074.
- 7) Family Stressors (X5) has a positive and significant effect on Family Stress (SK (Y3)). This can be seen from the path coefficient which is positive at 0.096 with a T-Statistic

value of 2.255, which is greater than the t-table of 1.96. Thus, Family Stressors (X5) has a direct effect on Family Stress (SK (Y3)) of 0.096, which means that every increase in Family Stressors (X5) will increase Family Stress SK (Y1) by 0.096.

- 8) Individual Stress (SI (Y1)) has a positive and significant effect on Individual Belief (IB (Y2)). This can be seen from the path coefficient which is positive at 0.547 with a T-Statistic value of 19.670, which is greater than the t-table of 1.96. Thus, Individual Stress (SI (Y1)) has a direct effect on Individual Belief (IB (Y2)) of 0.547, which means that every increase in Individual Stress (SI (Y1)) will increase Individual Belief (IB (Y2)) by 0.547.
- 9) Family Stress (SK (Y3)) has a positive and significant effect on Medication Compliance of Pulmonary TB Patients (KP (Y4)). This can be seen from the path coefficient which is positive at 0.087 with a T-Statistic value of 2.362, which is greater than the t-table of 1.96. Thus, Family Stress (SK (Y3)) has a direct effect on Medication Compliance of Pulmonary TB Patients (KP (Y4)) of 0.087, which means that every increase in Family Stress (SK (Y3)) will increase Medication Compliance of Pulmonary TB Patients (KP (Y4)) by 0.087.
- 10) Individual Belief (IB (Y2)) has a positive and significant effect on Medication Compliance of Pulmonary TB Patients (KP (Y4)). This can be seen from the path coefficient which is positive at 0.303 with a T-Statistic value of 9.187, which is greater than the t-table of 1.96. Thus, Individual Belief (IB (Y2)) has a direct effect on Medication Compliance of Pulmonary TB Patients (KP (Y4)) of 0.303, which means that every increase in Individual Belief (IB (Y2)) will increase Medication Compliance of Pulmonary TB Patients (KP (Y4)) by 0.303.
- 11) Family Resilience (FR (Z)) has a positive and significant effect on Medication Compliance of Pulmonary TB Patients (KP (Y4)). This can be seen from the path coefficient which is positive at 0.320 with a T-Statistic value of 5.571, which is greater than the t-table of 1.96. Thus, Family Resilience (FR (Z)) has a direct effect on Medication Compliance of Pulmonary TB Patients (KP (Y4)) of 0.320, which means that every increase in Family Resilience (FR (Z)) will increase Medication Compliance of Pulmonary TB Patients (KP (Y4)) by 0.320.
- 12) Interaction of Family Resilience and Family Stress (FR_SK) has a positive and significant effect on Medication Compliance of Pulmonary TB Patients (KP (Y4)). This can be seen from the path coefficient which is positive at 0.783 with a T-Statistic value of 7.512, which is greater than the t-table of 1.96. Thus, Interaction of Family Resilience and Family Stress (FR_SK) have a direct effect on Medication Compliance of Pulmonary TB Patients (KP (Y4)) of 0.783, which means that every increase in Interaction of Family Resilience and Family Stress (FR_SK) will increase Medication Compliance of Pulmonary TB Patients (KP (Y4)) by 0.783.

Discussion

Family stress factors have an effect on a family's capacity to solve problems and cope. They have the greatest total effect on the family's capacity to solve and to cope with problems. Family stress shows that less than half of families do not experience stress (normal) and the rest are mild to severe stress. Meanwhile, the results for Family Problem Solving and Coping Skills show that the majority have good coping skills.

The study by Farhan (2014) in Hariant (2021) stated that stress in family may negatively affects the patient being treated, due to the family's insufficient capacity in providing care. The causes of stress that occur in the family include environmental changes, changing family roles, emotional factors that arise in the family and the family's ability to finance family members who are being cared for (Dwi Hariant, Murtaqib, 2021). Caring for TB patients is a stressor that TB caregivers must face in the patient's family home (Zahroh et al., 2021). Family involvement as an active observer is an effective way to treat the patient and break the chain of transmission. Anxiety or stress reactions in the family that arise will have a negative impact on the level of family support and self-efficacy in caring for patients (Kamilah et al., 2020). Effective stress management and coping strategy in family in dealing with any problems arising due to caring for sick family members improves patient's compliance in taking medicines and reduce potential risks of disease-related adverse outcomes (Hidayah et al., 2020). Family is the entry point in providing health services in the community, to determine the risk of disruption due to the influence of lifestyle and the environment. The potential and involvement of family becomes even greater when one of their family members needs continuous help because their chronic health problem, such as pulmonary TB where the treatment is relatively long, i.e., 6-8 months. Families are focused on improving the health of all family members. In this condition, efforts are needed to improve the dynamics of internal family relationships, family structure and function which consist of effectiveness, socialization, reproduction, economy and health care for family members. The goal is for families to be able to care for sick family members and prevent disease transmission to other family members. The data studied for family stressors, family stress levels and coping were related to whether the family can determine the length and strength of the stressor experienced, how much and intense the stress is felt by the family and whether the family can cope with daily stressors and tensions, whether the family is able to act on objective and realistic assessment of the stressful situation, how the family reacts to stressful situations, what coping strategies the family adopts, and whether family members have different coping strategies. The active process of each family member in developing behavior and family resources in caring for family members who suffer from pulmonary TB shows the family's ability to resolve sources of problems in the family and family coping to reduce the impact of stressful life events.

The capacity of family or people who assist in identifying future stressors is needed so that anticipatory guidance and preventive coping strategies can be sought or provided to weaken or reduce the impact of stressors when family members are diagnosed with pulmonary TB which may lead to reduced productivity and roles in the family. Due to the sheer amount of energy expended by the family in dealing with stressors and stress, many family functions are often neglected until the family has the resources to deal with stressors and stress again. An example of a family with the latest situation when the family totally regulates family life around the care of a member who has pulmonary TB disease which has an impact on the development of the family's life journey. In the end, families are expected to have constructive coping in dealing with problems, families need to cooperate with each other in providing care to family members who suffer from pulmonary TB, be open to each other and express feelings related to changes in roles and functions due to problems that occur and open communication will help families in surviving and solving problems.

Every family goes through the family resilience phase, albeit with different process order. When a family has moved on to the next phase, there is a possibility that it will be thrown back into the initial phase when a new crisis or problem occurs. In addition, not every family starts from the same phase. Accuracy in determining the flow of the phases and strengths of the family itself helps families to adapt and develop in relation to their needs. Family resilience shows that families are able to be independent when caring for family members who suffer from pulmonary TB with the expected results that patients will have a support system in their family in accordance with the treatment process Lietz & Strength (2016) in (Rachmawati, Nursalam, et al., 2020). Family resilience shows the family's ability to survive, improve themselves, maintain a positive atmosphere at home during the process of adapting to stress, accept conditions that befall the family, such as when a family member is diagnosed with pulmonary TB, grow stronger when facing a crisis and ultimately overcome it, and gain experience dealing with problems and then be able to help others. Resilient families are able to manage pressure or stress by utilizing the resources owned by the family so that they do not get carried away in negative situations such as anxiety, stress and depression.

Conclusions

The results of this study show that the Family Resilience model in family stress on Medication Compliance of Pulmonary TB Patients is a fit model. Individual Factors of Pulmonary TB Patients, Treatment Category Factors, Family Factors, Social Factors, Family Stressor Factors, Individual Stress Factors, Individual Belief Factors, Family Stress Factors, and Moderating Family Resilience on Family Stress provide a relevant, accurate prediction on treatment compliance of patients with pulmonary TB of 90.7 percent. The dominant factor influencing medication compliance of pulmonary TB patients is the moderating factor of Family Resilience on Family Stress. Furthermore, for family

stress and Individual Belief, the dominant factor was Individual Stress. While Individual Stress is significantly influenced by individual factors of pulmonary TB patients.

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