

## **STRUCTURAL EQUATION MODELING-PARTIAL LEAST SQUARES (SEM-PLS) METHOD IN ANALYSIS OF THE EFFECT OF ANXIETY, FAMILY FUNCTION AND DEPRESSION ON THE QUALITY OF LIFE OF HEMODIALYSIS PATIENTS**

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### **Abstract**

This research aims to analyze the impact of worry/anxiety, family function, and depression on the quality of life of hemodialysis patients, using the Structural Equation Modeling-Partial Least Squares (SEM-PLS) method. Data was collected from 58 hemodialysis patients at RSUD Dr. R. Soedjati Soemodiardjo Purwodadi Grobogan used a questionnaire that included an anxiety scale, family function scale, depression scale and quality of life scale. Data analysis was carried out using the SEM-PLS technique to test the relationship between variables. The results showed that anxiety had a significant influence on the patient's level of depression. This influence is a unidirectional influence, meaning that if the patient's anxiety increases, the level of depression also increases. Anxiety also has a significant influence on the quality of life of hemodialysis patients. This influence is a negative influence, meaning that increasing anxiety causes the patient's quality of life to decrease. Conversely, if anxiety decreases, the patient's quality of life increases.

**Keywords:** Hemodialysis, Anxiety, Family Function, Depression, Quality of Life, Structural Equation Modeling-Partial Least Squares (SEM-PLS)

### **INTRODUCTION**

Quality of life is an important aspect that needs to be considered in the care of hemodialysis patients. Patients undergoing hemodialysis procedures often face various physical, psychological, and social challenges that can significantly affect their quality of life. In this context, factors such as anxiety level, family functioning, and the presence of depressive symptoms may have a strong impact on the quality of life of hemodialysis patients.

Anxiety and depression are two important aspects that are often experienced by hemodialysis patients. Physical discomfort, lifestyle changes, and uncertainty about their future health can be the main causes of anxiety and depression. Meanwhile, family function also has a significant role in determining how patients overcome these challenges, with strong support from the family environment can help improve the patient's quality of life.

This research concept, using a Structural Equation Modeling (SEM) approach, will allow examining the complex relationship between worry, family function, depression, and quality of life in hemodialysis patients. The existence of depression variables as mediating variables is equally useful in understanding the mediating role

of depressive symptoms in the relationship between anxiety, family function, and quality of life in hemodialysis patients.

Structural Equation Modeling (SEM) is a statistical method that blends factor analysis and regression analysis to explore connections among variables within a model. Its primary goal is to examine relationships between variables, whether they are between indicators and their constructs or among different constructs.

Although there has been previous research examining the relationship between these factors in the general population, more specific and in-depth research is needed in the hemodialysis patient population. By further understanding the dynamics of the relationship between anxiety, family function, depression, and the quality of life of hemodialysis patients, it is hoped that more effective intervention strategies will be found to improve the well-being and quality of life of hemodialysis patients.

## **METHOD**

Quantitative research methodology is employed in this study. Quantitative research involves the analysis of numerical data, which is processed utilizing statistical methods. The numerical data utilized in this research originates from a survey conducted by disseminating questionnaires to all chronic kidney failure patients undergoing hemodialysis at RSUD Dr. R. Soedjati Soemodiardjo Purwodadi Grobogan from October to December 2023.

Variables in this study include anxiety (X<sub>1</sub>), Family Function (X<sub>2</sub>), Depression (X<sub>3</sub>) and Quality of Life (Y).

Worry/anxious is a degree of emotional reaction that is described as a feeling of anxiety, fear, and unease regarding life situations. The level of anxiety is measured using a questionnaire distributed to hemodialysis patients at Dr. R. Soedjati Soemodiardjo Regional Hospital in Purwodadi Grobogan. According to the American Psychiatric Association (APA, 2013) A state of discomfort, fear related to preventing danger, the source of which is unknown. Anxiety is considered disturbing when someone experiences excessive fear and anxiety and there is a relationship with interference with social and work functioning (Townsend & Morgan, 2017 in Swarjana, 2022).

Family function is a family's cognitive activities which can be seen through interactions between families in carrying out their roles related to behavior in the family environment (Herawati et al., 2020). The instrument for measuring family function is the family support questionnaire. The instrument is a questionnaire to assess family support which consists of 5 statements regarding the patient's perception of family function (adaptation, partnership, growth, affection, and resolve). (Ayisi-Boateng et al., 2022).

Depression is a mental health disorder that affects a person's feelings, way of thinking and way of acting. Depression in the study was measured through

*Depression Anxiety Stress Scales 21(DASS-21)*, a questionnaire consisting of 21 statements to measure levels of depression, anxiety and stress which has been translated into Indonesian. Each has 7 questions to measure depression, anxiety and stress.

Quality of Life is a person's assessment of himself regarding his ability to meet his standard of living. The quality of life variable is assessed through a questionnaire distributed to hemodialysis patients at Dr. R. Soedjati Soemodiardjo Regional Hospital in Purwodadi Grobogan.

## RESULTS AND DISCUSSION

In SEM PLS analysis, the first thing to do is model evaluation. Model evaluation consists of two stages: evaluation of the measurement model (outer model) and evaluation of the structural model (inner model). The purpose of model evaluation is to assess the validity and reliability of a given model. According to Jogiyanto (2011: 69), a research concept and model cannot be tested within a predictive model of relational and causal relationships until it has successfully undergone the purification stage in the measurement model.

### Model Check

#### A. Outer Model

The initial stage of examining the model is examining the measurement model (outer model) or known as construct validity testing. As per Jogiyanto (2011:70), one method to test construct validity is to observe a strong correlation between the construct and the question items, along with a weak correlation with other variables

##### 1. Convergent Validity

At this stage, the value criteria that will be evaluated is the loading factor value. The loading factor values are provided in Table 1.

Table 1 Loading Factor

Indicator s	Depression	Family Functions	Worry	Quality of Life
K1				0.747
K2				0.834
K3				0.875
K4				0.912
X1.1			0.739	
X1.2			0.684	
X1.3			0.628	
X1.4			0.887	
X1.5			0.909	
X1.6			0.758	
X1.7			0.809	

X2.3		0.620
X2.4		0.878
X2.5		0.924
X3.1	0.788	
X3.2	0.762	
X3.3	0.896	
X3.4	0.820	
X3.5	0.822	
X3.6	0.847	

Processed with SmartPLS 3 software

The output loading factor values for the depression (X3) with six measurement indicators are X3.1= 0.788, X3.2= 0.7762, X3.3= 0.896, X3.4= 0.820, Furthermore, the value of the Family Function variable is only three valid measurement indicators, namely X2.3= 0.620, X2.4= 0.878, and X2.5= 0.924. The value of the anxiety variable with measurement indicators X1.1= 0.739, X1.2=0.684, X1.3=0.628, X1.4=0.887, X1.5=0.909, The loading factor value for the quality of life variable is with indicators K1=0.747, K2=0.834, K3=0.875 and K4=0.912. All of these indicators have a loading factor value above 0.60. Thus, the indicators forming the constructs of anxiety, family function, depression and quality of life above are categorized as valid.

## 2. Discriminant Validity

The value criteria that will be evaluated at this stage is the Cross Loading value. These cross loading values are presented in Table 2.

Table 2 Cross Loading

Indicator	Depression	Family Functions	Worry	Quality of Life
K1	-0.225	-0.013	-0.260	0.747
K2	-0.258	-0.009	-0.369	0.834
K3	-0.392	0.132	-0.375	0.875
K4	-0.455	0.119	-0.496	0.912
X1.1	0.493	-0.135	0.739	-0.357
X1.2	0.470	-0.126	0.684	-0.574
X1.3	0.278	-0.311	0.628	-0.229
X1.4	0.414	-0.179	0.887	-0.286
X1.5	0.421	-0.262	0.909	-0.331
X1.6	0.293	-0.258	0.758	-0.231
X1.7	0.507	-0.180	0.809	-0.366
X2.3	-0.065	0.620	-0.084	0.039
X2.4	0.052	0.878	-0.212	0.102
X2.5	-0.122	0.924	-0.272	0.058
X3.1	0.788	-0.032	0.338	-0.314
X3.2	0.762	-0.046	0.392	-0.261
X3.3	0.896	-0.051	0.450	-0.308

X3.4	0.820	0.002	0.594	-0.373
X3.5	0.822	-0.082	0.412	-0.425
X3.6	0.847	-0.097	0.455	-0.332

Processed with SmartPLS 3 software

All indicators in Table 2 above for the variables Depression, family function, anxiety and quality of life, already have cross loading values above 0.70. So it can be concluded that the correlation value between the indicators and the construct is greater than the correlation of the indicators with the other block constructs, so all statement items are declared discriminant valid. So it can be concluded that the four constructs are categorized as valid

### 3. Reliability Test

In PLS-SEM, the construct reliability testing stage is carried out by looking at the Cronbach's Alpha and composite reliability values. These two values are displayed in Table 3.

Table 3 Reliability Test

	Cronbach's Alpha	Composite Reliability
Depression	0.905	0.927
Family Functions	0.763	0.855
Worry	0.889	0.914
Quality of Life	0.867	0.908

Processed with SmartPLS 3 software

From the table above, the Cronbach's Alpha and composite reliability values for all variables are > 0.7, so the constructs of anxiety, family function, depression and quality of life are already deemed to have good reliability or are classified as reliable.

## B. Inner Model

The inner model, a structural model, is assessed based on the path coefficient value, which indicates the strength of influence between latent variables. This evaluation is conducted by examining the criteria values of R-Square and f-Square.

### 1. R Square

The estimation output for R-Square is presented in Table 4.

Table 4 Coefficient of Determination

Endogenous Variables	R Square	R Square Adjusted
Depression	0.306	0.281
Worry	0.066	0.049
Quality of Life	0.249	0.208

Processed with SmartPLS 3 software

Following the analysis using the bootstrapping method, the R-Square value for the depression variable was determined to be 0.306, the anxiety variable was 0.066, and the quality of life variable was 0.249. Thus, it can be concluded that the R-Square value for the depression variable is 0.306, which means that depression variability can be explained by the anxiety and family function variables in the model at 30.6%, which is included in the weak category.

Furthermore, the R Square value of the worry variable is 0.066, meaning that the variability in anxiety that can be explained by the family function variable in the model is 6.6%, which is also included in the weak category. On the other hand, the quality of life variable has an R-Square value of 0.249, which can be concluded that the variability in quality of life can be explained by the anxiety, family function and depression variables in the model of 24.9%, including in the weak category.

## 2. Effect Size

The output effect size is presented in Table 5.

Table 5 Effect Size

	Depressio n	Family Functions	Worry	Quality of Life
Depression				0.048
Family Functions	0.010		0.070	0,000
Worry	0.436			0.101
Quality of Life				

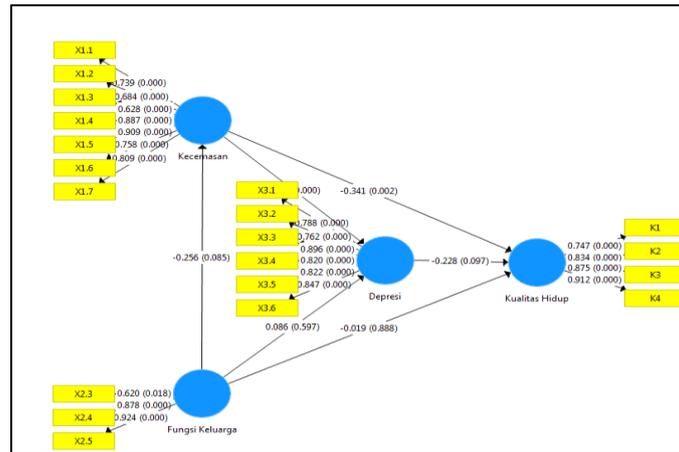
Processed with SmartPLS 3 software

The effect or influence of depression on quality of life of 0.048 is considered weak. The effect of family function on depression is 0.010, on anxiety is 0.070 and on quality of life is 0.000. This effect can be said to be weak.

The effect of anxiety on depression is 0.436, which is considered strong. Meanwhile, the effect of anxiety on quality of life is 0.101, considered moderate.

## Hypothesis testing

The path diagram of the influence of anxiety, family function and depression on the quality of life of hemodialysis patients is presented in Figure 1.



Processed with SmartPLS 3 software  
Figure 1 Path diagram

Hypothesis testing is conducted to evaluate multiple research hypotheses:

- 1) The influence of latent variables anxiety, family function and depression on the quality of life of hemodialysis patients.
- 2) The influence of family function variables and anxiety on depression
- 3) The influence of family function variables on anxiety.

Hypothesis testing is carried out by paying attention to the path analysis output presented in Table 6 below.

Table 6 Path Coefficient

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
Depression -> Quality of Life	-0.228	-0.245	0.137	1,662	0.097
Family Functioning -> Depression	0.086	0.097	0.162	0.529	0.597
Family Functioning -> Anxiety	-0.256	-0.263	0.149	1,723	0.085
Family Functioning -> Quality of Life	-0.019	-0.018	0.132	0.141	0.888
Anxiety -> Depression	0.569	0.602	0.089	6,391	0,000
Anxiety -> Quality of Life	-0.341	-0.344	0.111	3,072	0.002

Processed with SmartPLS 3 software

Based on Table 6, the path coefficient value for the influence of depression on quality of life is -0.228. The negative sign of the path coefficient indicates that increasing depression reduces the quality of life. However, the significance value (P Value) of 0.097 is greater than the alpha level of 0.05, so it is concluded that the effect is not significant at the alpha level of 5%.

The path coefficient value for the influence of family function variables on depression is 0.086. This path coefficient value is close to 0 (zero) indicating that family function has no effect on depression. In addition, the significance value (P Value) of 0.597 is greater than the alpha level of 0.05, so it can be concluded that family function does not have a significant effect on depression in hemodialysis patients.

The path coefficient value for the influence of family function on anxiety is -0.256. The negative sign of the path coefficient indicates that increasing family function can reduce patient anxiety. However, the significance value (P Value) of 0.085 is greater than the alpha level of 0.05, so it is concluded that the effect is not significant at the alpha level of 5%.

The path coefficient value for the influence of family function variables on quality of life is -0.019. This path coefficient value is close to 0 (zero) indicating that family function in this study has no effect on the patient's quality of life. In addition, the significance value (P Value) of 0.888 is greater than the alpha level of 0.05, so it can be concluded that family function does not have a significant effect on the quality of life in hemodialysis patients.

The path coefficient value for the influence of anxiety on depression is 0.569. A positive sign of the path coefficient indicates that increasing anxiety can increase the patient's depression. The significance value (P Value) of 0.000 is smaller than the alpha level of 0.05, so it is concluded that anxiety has a significant influence on depression in hemodialysis patients at an alpha level of 5%.

The path coefficient value for the influence of anxiety on depression is 0.569. A positive sign of the path coefficient indicates that increasing anxiety can increase the patient's depression. The significance value (P Value) of 0.000 is smaller than the alpha level of 0.05, so it is concluded that anxiety has a significant influence on depression in hemodialysis patients at an alpha level of 5%.

The path coefficient value of the influence of anxiety on quality of life is -0.341. The negative path coefficient sign indicates that increased anxiety can reduce the quality of life of hemodialysis patients. The significance value (P Value) of 0.002 is smaller than the alpha level of 0.05, so it is concluded that anxiety has a significant influence on the quality of life of hemodialysis patients at an alpha level of 5%.

Based on the findings of this study, it can be concluded that anxiety is a variable that significantly influences depression and the quality of life of hemodialysis patients at Dr. R. Soedjati Soemodardjo Regional Hospital in Purwodadi Grobogan. Therefore, efforts to reduce patients' anxiety levels need to be sought in order to enhance their quality of life and minimize depression.

## Indirect Effects

The output of the estimated total indirect effects is presented in Table 7 below.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
Family Functioning -> Depression	-0.146	-0.159	0.095	1,528	0.127
Family Functioning -> Quality of Life	0.101	0.104	0.086	1,173	0.241
Anxiety -> Quality of Life	-0.130	-0.149	0.091	1,419	0.156

Processed with SmartPLS 3 software

Based on Table 7, The indirect effect value for the impact of family function on depression through anxiety is -0.146, with a significance value of 0.127, which exceeds the alpha level of 0.05. Therefore, the anxiety variable does not serve as a mediator or intermediary. To put it differently, anxiety does not mediate the relationship between family function variables and depression.

The indirect effect value for the impact of family function on the quality of life of hemodialysis patients through the depression variable is 0.101, with a significance value of 0.241, exceeding the alpha level of 0.05. Therefore, the depression variable does not act as a mediator or intermediary. Put differently, depression does not mediate the influence of family function variables on the quality of life of hemodialysis patients.

The indirect effect value for the influence of anxiety on the patient's quality of life through the depression variable is -0.130 with a significance value of 0.156, this value is greater than the alpha level of 0.05. For this reason, the depression variable is not a mediator/intervening variable. In other words, the depression variable is not a variable that mediates the impact of the anxiety variable on the quality of life of hemodialysis patients.

## CONCLUSION

Results of analysis using the Structural Equation Modeling-Partial Least Squares method on data collected from patients undergoing hemodialysis at RSUD Dr. R. Soedjati Soemodiardjo Purwodadi Grobogan concluded that anxiety has a significant influence on the patient's level of depression. This influence is a unidirectional influence, meaning that if the patient's anxiety increases, the level of depression also increases.

Anxiety also has a significant influence on the quality of life of hemodialysis patients. This influence is a negative influence, meaning that increasing anxiety causes the patient's quality of life to decrease. Conversely, if anxiety decreases, the patient's quality of life increases.

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