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ANALYSIS OF MEDICATION ADHERENCE, SOCIAL SUPPORT, HEALTH LITERACY, AND PHYSICAL ACTIVITY ON QUALITY OF LIFE IN POST-KIDNEY TRANSPLANT PATIENTS

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ABSTRACT

This study analyzes the impact of medication adherence, social support, health literacy, and physical activity on the improvement of quality of life, mediated by patient satisfaction in post-kidney transplant patients at XYZ Hospital Jakarta. The research explores the relationships between these variables, focusing on how patient satisfaction and adherence to treatment impact Health-Related Quality of Life (HRQoL). The study employs a quantitative, analytical survey with a cross-sectional approach, involving 162 patient respondents from a census sample. Data was collected using a Likert scale-based questionnaire, and analyzed using structural equation modeling (SEM) with SmartPLS 4.0. The analysis included tests for validity, reliability, and several statistical assessments, such as collinearity, R-square, effect size, and predictive accuracy. The results indicate that four out of ten initial hypotheses were not significant, specifically regarding medication adherence. These findings highlight the importance of addressing patient compliance through improved social support and monitoring, as these factors significantly influence patient satisfaction and quality of life.

KEYWORDS *medication compliance; social support; health literacy; activity; physical; patient satisfaction*

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INTRODUCTION

Quality of life is also called health *Health-Related Quality of Life* (HRQoL) refers to the quality of life aspects related to a person's health, including how health conditions affect an individual's physical, mental, and social well-being. Based on a systematic review by (González, et al 2021) in the International Journal of Environmental Research and Public Health, it is shown that HRQoL measurement in patients with chronic diseases is crucial in understanding the impact of disease on their daily lives. In addition, (McGowan et al 2021) in Health Policy emphasizes the need for various HRQoL measurement instruments to evaluate effective health policies and interventions. Research by (Cabaco & Bonete-lópez, 2021) in the Journal of Health Economics also highlights the role of HRQoL in assessing the effectiveness of health interventions, showing that patients' quality of life depends not only on treatment, but also on their daily experiences.

When considering HRQoL in the context of post-kidney transplant patients, it is important to understand that their experience is very different compared to patients with other chronic diseases. Patients who have undergone kidney transplants often face a variety of challenges, including physical problems such as side effects of immunosuppressant medications, the risk of organ rejection, and the need to adhere to a strict treatment regimen. Research shows that HRQoL in post-kidney transplant patients can be affected by these factors, and precise measurements can provide insights into how patients assess their well-being after the procedure. In this case, the research by (Leal et al., 2022) in the *BMC Nephrology* showed that social support and mental health had a significant impact on HRQoL of kidney transplant patients.

Overall, integrating HRQoL in the care of post-kidney transplant patients is not only about improving health figures, but also about improving overall quality of life. Research by (Leal et al., 2022) in the *Clinical Transplantation* demonstrated how immunosuppressive therapy affects HRQoL and factors associated with improved quality of life. With an individual-focused approach and attention to patients' unique needs, healthcare providers can help them achieve better outcomes and improve their well-being in the long run. In addition, a review by (Ferreira et al., 2023) in the *Transplantation Reviews* explores the relationship between mental health and HRQoL, underlining the importance of psychological aspects in post-transplant care.

Adherence to medication is an important factor that determines the success of kidney transplants and health-related quality of life (HRQoL) improvements. Post-transplant patients are faced with the challenge of following a strict regimen of immunosuppressant drugs which is crucial to prevent organ rejection. However, the side effects of these medications, such as an increased risk of infection and other long-term complications, can complicate compliance. Research by (Leal et al., 2022) in the *BMC Nephrology* highlighting that patients with strong social support from family, friends, and healthcare workers are more likely to adhere to their treatment schedules. This social support can ease emotional burdens and provide practical assistance, such as medication reminders, which is essential for maintaining long-term compliance

Health literacy, or the ability to understand and process health-related information, is essential to ensure patients can manage their treatment regimens effectively. Patients with higher health literacy are better able to understand the importance of their medications, potential side effects, and when to seek medical attention, which can prevent post-transplant complications. According to (González et al 2021) in the *International Journal of Environmental Research and Public Health*, improving health literacy directly can improve health outcomes and improve HRQoL in chronic disease patients, including those recovering from kidney transplants

Physical activity plays an important role in increasing HRQoL in kidney transplant recipients. Participating in exercise regularly can help alleviate some of the physical complications associated with long-term immunosuppressive therapy, such as weight gain, muscle weakness, and an increased risk of cardiovascular disease. (Bai et al, 2021) in *Transplantation Proceedings* reported that kidney transplant recipients who exercised regularly experienced significant improvements in physical and emotional well-being compared to those who were physically inactive. Exercise not only improves physical health but also increases self-confidence, independence, and mental health but it is important to tailor a physical activity program to the patient's current health status and their physical limitations. Not all patients can do high-intensity exercise, and excessive exercise can lead to complications. The study (González et al 2023) in *Clinical Transplantation* emphasizes that healthcare providers must develop personalized exercise regimens that encourage gradual improvement while avoiding strain. This kind of personalized intervention ensures that patients can benefit from physical activity while minimizing risks

Patient satisfaction is a comprehensive measure that reflects the overall effectiveness of a healthcare intervention, including its impact on HRQoL. This satisfaction is shaped by a variety of factors, including the quality of communication with the healthcare provider, the extent to which the patient is involved in decision-making, and the perceived success of the treatment. According to (Sharma, 2020) in the *Journal of Clinical Medicine*, patients who are satisfied with their treatment tend to be more compliant with the treatment regimen and, ultimately, have better long-term health outcomes

Overall, improving HRQoL in post-transplant patients requires a multifaceted approach that addresses the medical, psychological, and social aspects of treatment. By focusing on medication adherence, health literacy, physical activity, and patient satisfaction, healthcare providers can help patients achieve better outcomes in the long term and improve their overall quality of life. Based on initial identification and observation at XYZ Hospital, which is the most private hospital in Indonesia that performs kidney transplants, in October 2024 it has been recorded that there have been more than 380 procedures. This makes Hospital X the second most hospital in Indonesia that has performed kidney transplants after Cipto Mangunkusumo Hospital which has had more than 1000 procedures.

The variables to be measured in this study are based on data obtained directly from the respondents. The independent variables in this study are *Adherence to Medicine of Social Support, Health Literacy*, *Physical* Activity and

as a mediation variable are *Patient Satisfaction* which mediates the bound variable i.e. *Improvement of HRQoL of Post Kidney Transplantation Patient.* The objective of this study is to test and analyze the positive influence of *Adherence to Medicine of Social Support, Health Literacy*, *Physical* Activities that can be mediated by *Patient Satisfaction* against *Improvement of HRQoL of Post Kidney Transplantation Patient*. These variables are adopted from previous empirical research in hospitals that have been carried out by (Richard, 1986) (*WilsonClearylinkingclinicalvariables_1995.Pdf*, n.d.) Mondesir, F. L., Carson, A. P., Durant, R. W., Lewis, M. W., Safford, M. M., & Levitan, E. B. (2020), Shah, J. M., Ramsbotham, J., Seib, C., Muir, R., & Bonner, A. (2021), Lestari, L., & Mukti, A. M. Y. (2024), Wang, Y., Bäumer, D., Ozga, A.-K., Körner, G., & Bäumer, A. (2021). Variabel dependen *Improvement of HRQoL of Post Kidney Transplantation Patient* is the variable to be explained and predicted as *outcome* of a model being tested.

In the context of post-kidney transplant patients, the experience differs significantly from other chronic disease patients. Kidney transplant recipients face multiple challenges, such as the side effects of immunosuppressive drugs, the risk of organ rejection, and the need for stringent medication adherence. As shown in the work of Leal et al. (2022), social support and mental health are integral factors influencing HRQoL in kidney transplant patients. Therefore, understanding how these elements interact is vital for improving patient care and treatment outcomes.

Despite the importance of medication adherence, health literacy, and physical activity in improving HRQoL, these factors have been insufficiently explored, particularly regarding their mediating effects on post-transplant patient satisfaction. Previous studies (Leal et al., 2022; Ferreira et al., 2023) have focused primarily on either one of these factors or have failed to establish comprehensive models that integrate them. This research fills the gap by investigating how medication adherence, social support, health literacy, and physical activity contribute to HRQoL, mediated by patient satisfaction.

The novelty of this study lies in its approach to examining these variables collectively and their interactions within the unique context of post-kidney transplant care. Most studies have overlooked the combined influence of these factors on HRQoL, particularly in the Indonesian healthcare setting. This research offers valuable insights that could inform the development of targeted interventions aimed at improving patient outcomes after kidney transplants.

This study offers several important benefits. Firstly, it contributes to improved patient care by helping healthcare providers better understand the factors that impact HRQoL in post-kidney transplant patients. These insights enable healthcare professionals to tailor interventions that address not only the medical aspects but also the emotional and social needs of patients. Secondly, the study promotes enhanced treatment compliance by identifying the significant role of social support, health literacy, and physical activity in medication adherence. This

provides valuable insights into how these factors can be leveraged to improve adherence, thereby reducing the risk of complications and improving transplant outcomes. Furthermore, the policy implications of this study are substantial, as the results could inform healthcare policies aimed at improving post-transplant care. This ensures that patients receive holistic support, which includes not only medical treatment but also social and psychological assistance. Finally, the study paves the way for future research directions, offering opportunities to explore specific interventions that can enhance HRQoL through better integration of medication adherence strategies, health education, and patient engagement in physical activity.

RESEARCH METHOD

This study uses an analysis unit in the form of patients who have undergone kidney transplants at XYZ Hospital in Jakarta and have undergone health checks in the last two months. XYZ Hospital was chosen because it is one of the hospitals with the highest number of kidney transplants in Indonesia. This study uses a cross-sectional study design, where data collection is carried out once within a certain time span. Respondents in this study met the inclusion criteria, namely patients who had undergone a kidney transplant, were aged between 17 and 65 years, and had had a health visit at XYZ Hospital in the past two months.

Variable operationalization is carried out by measuring several important aspects related to post-kidney transplant patients. The variables measured included adherence to drugs, social support, health literacy, physical activity, patient satisfaction, and improvement in quality of life after kidney transplantation. This measurement uses a questionnaire with a *Likert* scale consisting of six parts, which is compiled to obtain numerical data that is then statistically analyzed.

The population of this study consists of all patients who meet the inclusion criteria based on medical record data in August and September 2024, with a total of 191 patients. The sample was selected using the census method (*total sampling*) due to the limited population size, as well as the *quota sampling* approach to ensure the sample is representative of demographic characteristics such as age and gender. Sampling was carried out using *purposive sampling*, where only patients who met certain criteria were selected as respondents.

Primary data was collected through questionnaires distributed to respondents, with the answers then processed into numerical data. The data obtained were analyzed using inferential statistics. For data analysis, *Structural Equation Modeling* (*SEM*) with *SmartPLS* 4.0 software was used. This analysis process included two main stages: testing the measurement model (*outer model*) and testing the structural model (*inner model*). At the measurement model testing stage, the validity and reliability of the indicators were tested using loading indicators, *Cronbach's alpha*, composite reliability, average variance extracted (*AVE*), and discriminant validity (*HTMT*). Meanwhile, at the structural model testing stage, a collinearity test (*VIF*), determination coefficient test (R^2), effect size

test (f^2), predictive accuracy test (Q^2), as well as hypothesis and mediation tests through the *bootstrapping* feature were carried out to test the significance of the relationships between variables. With this approach, it is hoped that this study can provide a deeper understanding of the factors that affect the quality of life of patients after kidney transplantation.

RESULT AND DISCUSSIONS

In this study, quantitative research with the Partial Least Square Method (PLS) is one of the nonparametric statistical analysis methods that allows to analyze the relationship between variables in a model consisting of many variables (Risher, 2018) In data analysis with PLS-SEM, the first stage carried out is to test the validity and reliability of the outer model or also known as the measurement model. Validity and reliability tests are used to test and evaluate whether the reflexive indicators used are valid and able to measure latent variables (constructs) well. To obtain the output of the outer model in this study, SmartPLS 3.2.9 software was used.

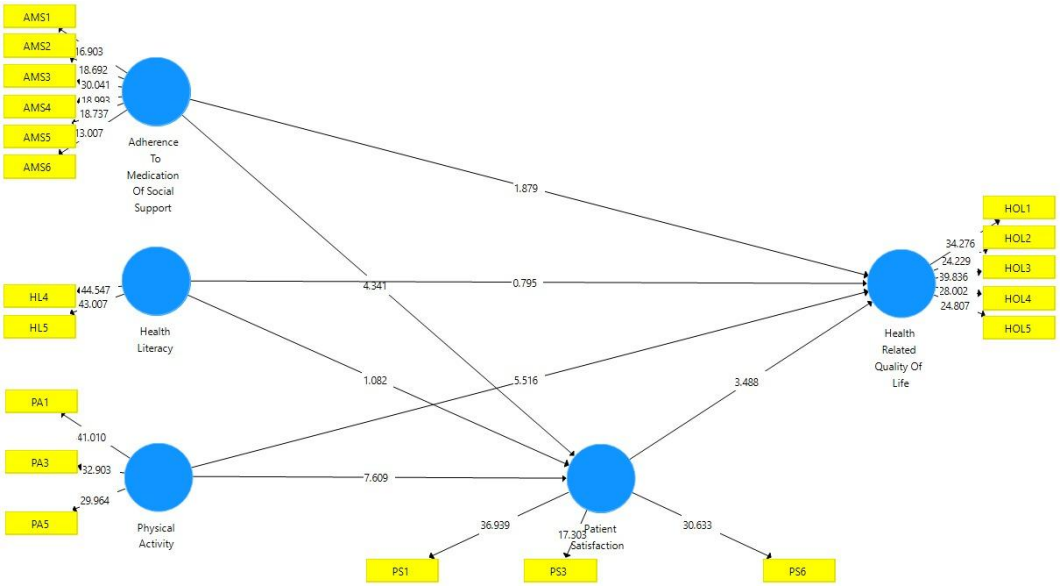

Figure 1. Outer Model
Source: Data by Researcher

Outer Model (Validity Test)

A measurement model is a model that explains the relationship between variables and their indicators. The measurement model was carried out to assess the validity and reliability of the research. Validity testing on the PLS-SEM method can be carried out in two ways, namely convergent validity and discriminatory validity. Convergent validity is the loading factor and the AVE value is latent with the indicator, if the loading factor ≥ 0.7 and the AVE > 0.5, then the indicator used is valid (Legate et al., 2023). The rule of thumb for convergent validity is a loading factor > 0.7; however, 0.50 – 0.60 can still be used, the average variance extracted

(AVE) > 0.5; and the discrimination analysis must meet the Fornell-Larcker criterion, that is, the square root value of the AVE must be greater than the correlation value between variables. The AVE value must be greater than the latent variable correlation; When applying cross loading, the value that must be obtained is > 0.7.

Table 1. Measurement Model Test Result (Factor Loading)

	Adherence To Medication Of Social Support	Health Literacy	Health Related Quality Of Life	Patient Satisfaction	Physical Activity
AMS1	**0,765**				
AMS2	**0,777**				
AMS3	**0,823**				
AMS4	**0,799**				
AMS5	**0,723**				
AMS6	**0,712**				
HL4		**0,901**			
HL5		**0,897**			
WHERE1			**0,882**		
WHERE2			**0,863**		
WHERE3			**0,886**		
WHERE4			**0,831**		
WHERE5			**0,811**		
PA1					**0,871**
PA3					**0,849**
PA5					**0,852**
PS1				**0,865**	
PS3				**0,804**	
PS6				**0,840**	

Source: Data by Researcher

The value of the loading factor shows the correlation between the indicator and its construction. An indicator with a low loading value indicates that the indicator is not working on its measurement model. The expected loading value > 0.7, and the value recorded in the loading factor table in this problem averages > 0.7.

Table 2. Fornel Larckers Criterion

	Adherence To Medication Of Social Support	Health Literacy	Health Related Quality Of Life	Patient Satisfaction	Physical Activity
Adherence To Medication Of Social Support	0,767				
Health Literacy	0,749	0,899			
Health Related Quality Of Life	0,750	0,703	0,855		
Patient Satisfaction	0,751	0,687	0,819	0,836	
Physical Activity	0,740	0,720	0,850	0,812	0,858

Source: Data by Researcher

Directly the narrative from table 2

Based on table 3 above, the variable has a high value of 0.767 compared to other variables, as well as the variable health literacy has a high value of 0.899, followed by the health related quality of life variable of (0.855), patient satisfaction with a value of (0.836) and ended with the physical activity variable with a value of (0.858).

Table 3. Cross Loading

	Adherence To Medication Of Social Support	Health Literacy	Health Related Quality Of Life	Patient Satisfaction	Physical Activity
AMS1	0,765	0,634	0,624	0,494	0,559
AMS2	0,777	0,531	0,530	0,562	0,521
AMS3	0,823	0,683	0,664	0,622	0,613
AMS4	0,799	0,599	0,530	0,632	0,602
AMS5	0,723	0,537	0,622	0,589	0,671
AMS6	0,712	0,441	0,456	0,549	0,410
HL4	0,677	0,901	0,645	0,617	0,642
HL5	0,669	0,897	0,618	0,618	0,653
WHERE1	0,682	0,615	0,882	0,703	0,750
WHERE2	0,705	0,654	0,863	0,673	0,730
WHERE3	0,671	0,600	0,886	0,726	0,752
WHERE4	0,574	0,545	0,831	0,706	0,669
WHERE5	0,566	0,587	0,811	0,693	0,731
PA1	0,599	0,628	0,705	0,645	0,871
PA3	0,637	0,565	0,726	0,640	0,849
PA5	0,662	0,655	0,753	0,790	0,852
PS1	0,627	0,585	0,724	0,865	0,713
PS3	0,666	0,561	0,602	0,804	0,667
PS6	0,595	0,578	0,723	0,840	0,656

Source: Data by Researcher

Cross loading is declared valid if the value in the variable is greater than > 0.7. Each variate that is included in the cross loading table has qualified as an example of the value of the AMS variable 1-6 has a value of (< 0.7).

Outer Model (Reability Test)

Reliability Test In this outer model analysis, a reliability test was carried out by evaluating Cronbach's alpha and composite reliability values with the criterion that if the value is > 0.7, then it is reliable (Risher, 2018) (Hair et al., 2019; Hair et al., 2020).

Table 4. Result Of Reliability Testing

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Adherence To Medication Of Social Support	0,860	0,863	0,895	0,589
Health Literacy	0,762	0,762	0,894	0,808
Health Related Quality Of Life	0,908	0,909	0,931	0,731
Patient Satisfaction	0,785	0,788	0,875	0,700
Physical Activity	0,821	0,823	0,893	0,735

Source: Data by Researcher

This test, conducted with Cronbach's Alpha, showed directly the results of the validity and reliability of a questionnaire used in the study (Palupi, 2013). The higher the value of Cronbach's Alpha, the more reliable and the indicator is said to be valid if the value of Cronbach Apha if Item Deleted < Cronbach Alpha. Likewise, the composite reliability value shows > 0.7 so that it is declared reliable to be used as a reference in determining the inner model.

Outer Model (coefficient of determination R-Square)

The R-squared value or determination coefficient explains how much the dependent variable can be affected by the independent variable. The value of the R-square ranges from 0 to 1 ($0 \leq R2 \leq 1$), the higher the value of the R-square, the greater the influence of the independent variable on the dependent variable. As a rule of thumb, $R2 > 0.75$ (strong), $R2 > 0.50$ (moderate), and $R2 > 0.25$ (weak), but if an R-square value above 0.9 is found, the model can be considered overfit. (Sarstedt et al., 2017; Hair et al., 2021)

Table 5. Coefficient of Determination

Variable	R Square	R Square Adjusted
Health Related Quality Of Life	0,784	0,778
Patient Satisfaction	0,711	0,706

Source: Data by Researcher

Based on the data presented in table 6 above, it can be seen that the R-Square value for **the Health Related Quality Of Life variable** is 0.784, the acquisition of this value explains that the percentage of Health **Related Quality Of Life** can be explained by the Coefficient of Determination of 66.1%. The R-Square value for the Patient Satisfaction variable is 0.11, the acquisition of this value explains that the percentage of calm behavior is large.

Table 6. Effect Size F²

Variable	Adherence To Medication Of Social Support	Health Literacy	Health Related Quality Of Life	Patient Satisfaction	Physical Activity
Adherence To Medication Of Social Support			0,028	0,106	
Health Literacy			0,007	0,009	
Health Related Quality Of Life					
Patient Satisfaction			0,118		
Physical Activity			0,278	0,388	

Source: Data by Researcher

Effect size measurements can be grouped into two major classifications, namely standardized mean differences and the size of the association or proportion of variance described (Olejnik and Algina, 2000,2003). Both can then be transformed into f-values so that they can be compared with each other, as well as to get a standardized effect size

Table 7. Predictive Relevance Q²

Variable	SSO	SSE	Q²(=1-SSE/SSO)
Health Reality Quality of Life	810,000	256,410	0,560
Patience Satisfication	486,000	251,314	0,483

Source: Data by Researcher

In the explanation of table 8 about predictive relevance, it can be seen that the Q square values in the variables are 0.560 and 0.483. By looking at these values, it can be concluded that this study has a good observation value because the Q Square values > 0 (zero), namely 0.560 and 0.483

Inner Model (Hypothesis Test)

This test was carried out by bootstrapping method using re-sampling and processed with SmartPLSTM 3.2.9 (Ringle et al., 2015; Memon et al., 2021). Since the direction of influence of the hypothesis has been clearly stated as "positive/negative", the proper statistical test is one-tailed. It is said that there is a positive and significant influence if the T-statistical value > T-table (1.645) is at a significance level of 5% (alpha = 0.05), on the other hand, if the T-statistic < T-table (1.645), there is no significant influence between the two variables (Ringle et al., 2015; Sarstedt et al., 2017). The following table 9 shows the results of PLS-SEM data processing to determine the results of hypothesis testing.

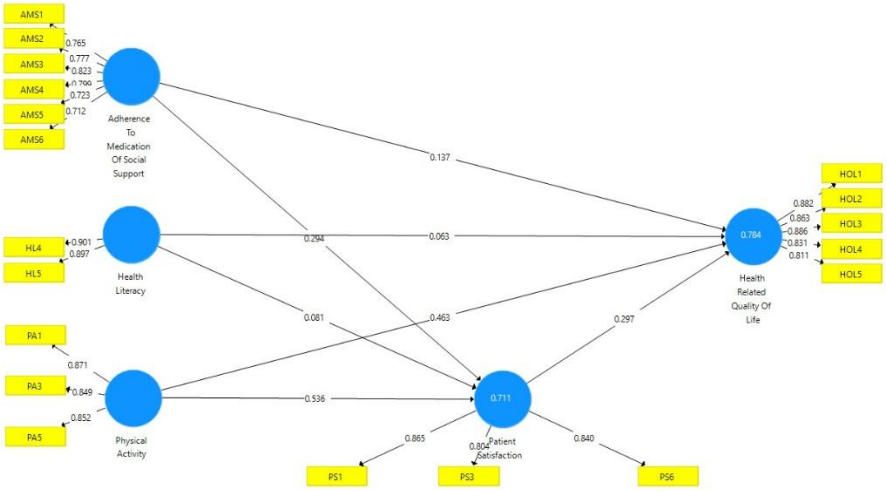

Figure 2. Inner Model
Source: Data by Researcher

Statistical testing

Table 8. Result of the Hypothesis Testing Structural Models

Variable	*Original Sample (O)*	*Sample Mean (M)*	*Standard Deviation (STDEV)*	*T Statistics (|O/STDEV|)*	*P Values*	*Significant*
Adherence To Medication Of Social support -> Health Related Quality Of Life	0,137	0,147	0,071	1,926	0,055	*No*
Adherence To Medication of Social support -> Patience Satisfaction	0,294	0,294	0,067	4,370	0,000	*Yes*
Health Literacy - > Health Reality Quality Of Life	0,063	0,049	0,074	0,849	0,396	*No*
Health Literacy -> Patience Satisfaction	0,081	0,083	0,074	1,091	0,276	*No*
Patience Satisfaction -> Health Related Quality Of Life	0,297	0,298	0,075	3,946	0,000	*Yes*
Physical Activity - > Health Related Quality Of Life	0,463	0,467	0,078	5,965	0,000	*Yes*
Physical Activity - > Patience Satisfication	0,536	0,534	0,072	7,487	0,000	*Yes*
Adherence To Medication Of Social Support -> Patience Satisfaction- > Health Related Quality Of Life	0,087	0,087	0,028	3,082	0,000	*Yes*
Health Literacy -> Patience Satisfication-> Health Related Quality Of Life	0,024	0,027	0,025	0,948	0,376	No
Physical Activity - > Patience Satisfication-> Health Related Quality Of Life	0,159	0,159	0,043	3,666	0,000	*Yes*

Source: Data by Researcher

Based on the p value displayed in table 9, the table has displayed significant and non-significant values that refer to the initial hypothesis, resulting in the final Hypothesis that is categorized as accepted and rejected which can be explained as follows:

H1. Adherence To Medication Of Social Support has no significant effect on Health Realted Quality Of Life with a p > value of 0.05 so that the H0 hypothesis is accepted and H1 is rejected, according to research conducted by (Richter et al., 2022) and (Wang, 2024).

H2. Adherence To Medication Of Social support has a significant influence on Patience Satisfication with a P value of < 0.05 so that the H0 hypothesis is rejected and H1 is accepted, this is in accordance with the research put forward by (Khan et al., 2019).

H3 Health Literacy does not have a significant influence on Health Reality Quality Of Life with a value of p >0.05 so that the H0 hypothesis is accepted and H1 is rejected in line with the value put forward by (Cepeda-Carrion et al., 2019).

H4. Health Literacy does not have a significant influence on Patience Satisfaction with a P value of > 0.05 so that H0 is accepted and H1 is rejected, this is in line with research conducted by (Ciavolino et al., 2022).

H5. Patience Satisfaction has a significant influence on Health Related Quality Of Life with a p < value of 0.05 (0.00) so that H0 is rejected and H1 is accepted, this is in line with research conducted by (Khan et al., 2019).

H6. Physical Activity has a significant influence on Health Related Quality Of Life with a p value of <0.05 (0.00) so that H0 is declared rejected and H1 is accepted in line with the research conducted by (Legate et al., 2023).

H7. Physical Activity has a significant influence on Patience Satisfication with a p < value of 0.05 (0.00) so that H0 is declared accepted and H1 is rejected according to research conducted by (Sarstedt, 2016).

H8. Adherence To Medication Of Social support has a significant influence on Patience Satisfication through Health Related Quality Of Life with a p < value of 0.05 (0.00) so that the H0 hypothesis is declared accepted and H1 is rejected according to the research conducted by.(Memon et al., 2021).

H9. Health Literacy did not have a significant influence on Patience Satisfaction through Health Related Quality Of Life with a p > value of 0.05 (0.376) so that H0 was accepted and H1 was declared rejected according to the research conducted by.(Saragih et al., 2015).

H10. Physical Activity has the influence of Patience Satisfaction through Health Related Quality Of Life with a value of p <0.05 (0.00) so that H0 is accepted and H1 is declared rejected according to the research conducted by.(Ringle et al., 2014).

Based on the results of data management managed through statistical testing of sample data distributed to respondents, the researcher has obtained significant and insignificant values for the variables formed. The p value is the final benchmark that can be used as a conclusion so that the right steps can be taken to take the right steps against variables that do not affect each other. In the last ten hypotheses, four variables were found to have values above the standard value p, namely (0.055, 0.3996, 0.276, 0.376) and the rest were variables that mutually affected the patient's compliance with social influences.

CONCLUSION

This study analyzed patients' adherence to medication in relation to social support, using *SEM PLS* to test both inner and outer models and determine the significance of hypotheses based on *p* values (< 0.05 indicating significance). The findings, which distinguish between significant and non-significant effects, provide a basis for further actions and recommendations for both the community and hospitals regarding the influence of social support on medication adherence among patients. For future research, expanding the sample size and adopting a longitudinal design could improve the generalizability and robustness of results, while exploring environmental and psychological factors, as well as the role of healthcare providers, would offer a more comprehensive understanding of adherence. Employing advanced analytical methods, such as mixed-methods approaches, and considering cultural contexts are also recommended to better capture the diverse factors influencing medication adherence and quality of life in post-kidney transplant patients.

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