A Prospective Study on the Effectiveness of Multifaceted Therapeutic Intervention in Single-Organ Transplant Recipients at selected transplant centres in the central zone of Kerala

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Abstract

Background: The study examined psychosocial, behavioral, and medical challenges among single-organ transplant recipients, who often face anxiety, depression, medication non-adherence, and unhealthy lifestyle practices that can jeopardize graft survival and overall well-being.

Methods: A prospective two-group pre-test post-test design was conducted among 100 kidney and liver transplant recipients (50 experimental and 50 control) attending follow-up clinics in accredited transplant centers in Kerala from January 2024 to January 2025. Participants aged 18–65 years and 6–24 months post-transplant were selected through purposive sampling. The experimental group received a multifaceted intervention that included symptom-targeted psychotherapy, medication counseling, and lifestyle education, whereas the control group continued routine care. Data were collected at baseline and after 3 months using the depression anxiety stress scale, medication adherence rating scale, and HRQoL Survey Form-36 (SF-36), and were analyzed using paired t-tests, Chi-square tests, and analysis of variance at a 0.05 significance level.

Result: The intervention produced significant improvements across psychosocial, behavioral, and lifestyle domains, with reductions in anxiety ($P = 0.03$) and depression ($P = 0.02$), and increases in self-esteem ($P = 0.04$) and perceived social support ($P = 0.01$). Medication adherence was higher in the experimental group (80% vs. 52%; $P = 0.01$), and health-related quality of life (HRQOL) scores improved substantially (82.5 ± 7.8 vs. 70.6 ± 8.9; $P = 0.01$).

Conclusion: The intervention was highly effective in enhancing psychosocial well-being and lifestyle outcomes. Participants demonstrated significant reductions in anxiety and depression, along with improved self-esteem and social support. In addition, medication adherence and HRQOL markedly increased in the experimental group, confirming the positive impact of the intervention.

Keywords: Multifaceted intervention, transplant recipients, psychosocial factors, adherence, lifestyle, quality of life, Kerala

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INTRODUCTION

Organ transplantation has revolutionized the management of end-stage organ failure, offering patients significantly improved survival and quality of life.[1] However, transplant success extends far beyond the surgical procedure. Long-term outcomes are strongly influenced by psychosocial well-being, behavioral practices, and lifestyle adjustments made by recipients. Evidence indicates that these multidimensional

factors collectively determine graft survival, functional recovery, and overall health.[2] Thus, understanding the therapeutic needs of transplant recipients is essential for developing interventions that support sustained post-transplant stability.

A critical determinant of transplant success is medication adherence. Immunosuppressive therapy is vital to prevent acute and chronic rejection, yet maintaining strict adherence remains challenging. Studies indicate that 30–50% of recipients demonstrate some degree of non-adherence, which is a leading cause of graft rejection, morbidity, and hospital readmissions.[3] Barriers include forgetfulness, adverse effects, complex regimens, and psychological distress. Depression, anxiety, and emotional exhaustion often reduce patients' capacity to follow medical recommendations consistently.[4] Additional factors such as socioeconomic pressures, limited health literacy, and insufficient family support further complicate adherence.[4,5] These findings suggest that medication-related challenges are closely intertwined with psychosocial and behavioral factors, highlighting the need for integrated therapeutic strategies rather than isolated educational reminders.

Psychological well-being also plays a significant role in post-transplant health. Many recipients experience anxiety, depression, fear of graft rejection, and uncertainty about their future health.[4] Chronic stress from lifelong medication, lifestyle restrictions, and unpredictable graft functioning can erode self-care capacity, leading to inconsistent medication intake, reduced physical activity, and poor engagement with follow-up care.[1,4] Poor psychological health has been associated with lower health-related quality of life (HRQOL) and adverse clinical outcomes.[2] These observations underscore the importance of psychosocial support as a core element of transplant care.

Structured psychosocial interventions have shown promise in addressing these challenges. Approaches such as cognitive-behavioral therapy (CBT), stress-reduction techniques, motivational interviewing, and peer support have demonstrated efficacy in reducing anxiety and depression while improving self-care behaviors.[6] When implemented consistently, these interventions enhance emotional resilience, foster adaptive coping strategies, and encourage recipients to take greater responsibility for managing their health. Combining psychological counseling with patient-centered education enables recipients to make informed decisions regarding medication adherence and lifestyle modifications, offering a more sustainable framework for long-term adjustment than conventional biomedical care alone.

Lifestyle modifications constitute another crucial aspect of post-transplant management. Recipients must adopt appropriate dietary practices, maintain adequate physical activity, regulate sleep patterns, and moderate substance use to prevent complications related to immunosuppressive therapy, including weight gain, hypertension, metabolic syndrome, and cardiovascular disease.[7] Poor nutrition, physical inactivity, and sleep disturbances are common after transplantation and can negatively impact graft function.[2] Evidence indicates that structured exercise programs improve physical functioning, muscle strength, fatigue, and mental well-being.[8] Tailored dietary counseling helps mitigate the metabolic side effects of immunosuppressive medications, whereas smoking cessation and alcohol moderation reduce the risk of graft damage, infections, and long-term health complications. Collectively, these lifestyle interventions emphasize the need for continuous, individualized, and comprehensive post-transplant guidance.

Kerala's healthcare system has made remarkable progress in transplant medicine, providing a strong foundation for implementing multidisciplinary care models. Over the past decade, the state has emerged as a leader in organ donation and transplantation, driven by advances in surgical expertise, improved coordination between healthcare institutions, and increased public awareness.[9] As transplant numbers rise, the demand for integrated psychosocial and behavioral interventions has also grown. Kerala's network of transplant centers and skilled nursing professionals is well-positioned to adopt holistic care strategies that address psychological health, medication adherence, and lifestyle modification in a coordinated manner. However, despite these strengths, evidence on region-specific models that combine these elements into a single structured intervention remains limited. Understanding the local context, including cultural norms, family dynamics, and socioeconomic diversity, is essential for designing interventions that are both feasible and effective.[10]

Single-organ transplant recipients face complex psychosocial, behavioral, and lifestyle challenges that threaten graft longevity and long-term well-being,[2] particularly when depression, anxiety, stress, and medication non-adherence are present. Although nurses and allied health professionals play a crucial role in providing psychosocial support, reinforcing adherence, and promoting healthy behaviors, limited research in India, especially in Kerala, has evaluated the combined impact of structured interventions integrating psychological counseling, medication education, and lifestyle modification.[11,12] Existing evidence is largely Western-centric and does not account for regional cultural norms, family dynamics, and healthcare practices. With transplant rates rising in Kerala, there is a lack of regional data on how demographics influence intervention outcomes.[1,11] This study aims to bridge the gap by assessing the effectiveness of a comprehensive, culturally tailored multifaceted therapeutic program to enhance psychosocial well-being, adherence, and health-related quality of life among transplant recipients.[2,10]

The study aims to evaluate the effect of a multifaceted therapeutic intervention on psychosocial factors, medication adherence, and lifestyle modifications among single-organ transplant recipients, using standardized quality-of-life measures. It also seeks to determine the association between demographic variables and study outcomes. This

is important because psychosocial stress, poor adherence to medication, and unhealthy lifestyle behaviors continue to compromise graft survival and quality of life among transplant recipients in central Kerala, while evidence for integrated therapeutic interventions to address these issues remains limited.

METHODS

Research design

This study adopted a prospective, quasi-experimental pre-test post-test control group design to evaluate the effectiveness of a multifaceted therapeutic intervention on psychosocial status, medication adherence, and lifestyle behaviors among single-organ transplant recipients. The study was conducted between January 2024 and January 2025 among 100 participants (50 experimental and 50 control) attending follow-up clinics in selected accredited transplant centers in Kerala.

Research setting

The study was conducted in accredited transplant centers in Kottayam district and Ernakulam districts, the central zone of Kerala, recognized for high volumes of kidney and liver transplant procedures. Centers were selected based on institutional approval, accessibility, and the availability of multidisciplinary post-transplant care services.

Target population

Adults aged 18–65 years who had undergone kidney or liver transplantation within the past 6–24 months and were attending follow-up clinics at the selected centers.

Sampling technique

A purposive sampling technique was used to recruit participants who met the eligibility criteria and provided informed consent.

Sample size

The sample size for this study was determined to be 100 participants, with 50 participants allocated to each group. This calculation was based on a priori power analysis, assuming a medium effect size of 0.5, a significance level of 0.05, and a desired power of 0.80.

Inclusion criteria

- Adults aged 18–65 years
- Single-organ transplant recipients (kidney and liver)
- 6–24 months post-transplant
- Clinically stable at recruitment
- Able to understand the study and provide written informed consent

Exclusion criteria

- Multiorgan transplant recipients
- Diagnosed psychiatric illness or cognitive impairment
- Medically unstable or experiencing acute complications
- Those enrolled in other psychosocial or lifestyle interventions

Variables and instruments

Psychosocial factors–depression anxiety stress scale (DASS)-21

The DASS-21, developed by Lovibond and Lovibond, was used to measure psychosocial status.

- Reliability: Cronbach's α = 0.88 (depression), 0.82 (anxiety), and 0.90 (stress)
- Validity: Established construct validity in clinical populations

Medication adherence–medication adherence rating scale (MARS)

Medication adherence was assessed using the MARS by Thompson.

- Reliability: Cronbach's α = 0.75
- Validity: Widely used in chronic illness and transplant research

Lifestyle/HRQOL–SF-36

Lifestyle-related quality of life was measured using the SF-36 Health Survey (Ware and Sherbourne).

- Reliability: Cronbach's α ranges from 0.78 to 0.93
- Validity: Strong construct and criterion validity across populations

Development of the intervention program

The multifaceted intervention consisted of three components:

Symptom-targeted psychotherapy

Delivered through structured sessions focusing on stress management, mindfulness practices, emotional regulation, CBT-based strategies, and coping enhancement tailored for transplant recipients.

Medication counseling

Sessions emphasized adherence importance, side-effect management, timing strategies, and clarification of immunosuppressive regimens.

Lifestyle education

Participants received individualized training on

- Diet planning (low-sodium, low-fat, and adequate protein)
- Safe exercise routines
- Sleep hygiene
- Smoking/alcohol cessation

The program followed a patient-centred, culturally competent approach.

Data collection procedure

Data were collected at two time points:

- Pre-intervention baseline (January 2024)
- Post-intervention follow-up (3 months later)

Structured interviews, validated instruments, and clinical records were used. Reminder calls ensured compliance with follow-up visits.

Ethical considerations

Ethical approval was granted by the Institutional Ethics Committee of Medical College Kottayam (Approval No.: IEC/2023/045). The study adhered to ICMR Ethical Guidelines (2020). Participants were informed of the study purpose, procedures, risks, benefits, and voluntary participation rights. Confidentiality and withdrawal rights were ensured.

Pilot study

A pilot study was conducted from November 1, 2023 to December 15, 2023, with 10% of the sample to assess feasibility, clarity of tools, and implementation logistics. Feedback-informed refinement of data collection procedures and intervention delivery.

Descriptive statistics

Frequencies, percentages, means, and standard deviations described demographic variables and baseline measures.

Inferential statistics

- Paired t-test for within-group pre-post differences
- Independent t-test/analysis of variance (ANOVA) for between-group comparisons
- Chi-square test for associations between categorical variables. A significance level of $P < 0.05$ was used.

Results

This chapter presents the results of the study conducted to evaluate the effectiveness of a multifaceted therapeutic intervention among single-organ transplant recipients in selected transplant centers in Kerala. The findings are organized and discussed under major domains, including psychosocial factors, medication adherence, lifestyle modifications, and health-related quality of life (HRQOL). Statistical analyses were performed to compare outcomes between the experimental and control groups and to determine the significance of observed differences. The study aimed to assess the impact of the intervention on psychological well-being, adherence behaviors, and overall quality of life, as well as to explore associations between selected demographic variables and post-intervention outcomes. Quantitative data were analyzed using descriptive and inferential statistics, including *t*-tests, Chi-square tests, and ANOVA, to identify significant improvements and relationships.

Table 1 indicates that the experimental group demonstrated significantly lower mean anxiety scores (12.4 ± 3.2) compared to the control group (15.6 ± 4.1; $P = 0.03$), suggesting that the intervention effectively reduced anxiety levels. Similarly, depression scores were significantly lower in the experimental group (10.1 ± 2.8) than in the control group (13.8 ± 3.5; $P = 0.02$), indicating improved emotional well-being. In contrast, self-esteem levels were significantly higher in the experimental group (28.5 ± 5.0) compared to the control group (24.2 ± 5.6; $P = 0.04$), showing enhanced self-worth following the intervention. Furthermore, social support scores were notably greater among the experimental participants (35.2 ± 6.1) than among controls (30.8 ± 6.7; $P = 0.01$), implying increased perceived social support. Finally, overall psychosocial adjustment was significantly better in the experimental group (78.6 ± 8.3) than in the control group (70.4 ± 9.2; $P = 0.02$), reflecting a comprehensive positive effect of the intervention.

Figure 1 illustrates the mean scores of depression, anxiety, and stress among participants before and after the therapeutic intervention. The orange bars represent pre-intervention scores, whereas the darker orange (red-orange) bars represent post-intervention scores. A noticeable reduction in all three psychosocial indicators is observed after the intervention – Depression: The mean depression score decreased substantially from approximately 22 before the intervention to around 12 after the intervention, indicating a marked improvement in mood and emotional stability. Anxiety: The mean anxiety score dropped from about 18 pre-interventions to roughly 8 post-interventions, suggesting that the intervention effectively alleviated anxiety symptoms. Stress: Similarly, stress levels showed a significant decline, with mean scores reducing from approximately 26 to 15, reflecting a considerable improvement in participants' ability to manage stress. Overall, the post-intervention scores for depression, anxiety, and stress were consistently lower than the pre-intervention levels, implying that the therapeutic intervention was effective in enhancing emotional and psychological well-being among the participants.

Table 2 indicates a notable improvement in adherence among participants in the experimental group compared to the control group. Specifically, 80% of participants in the experimental group demonstrated high adherence, whereas only 52% of those in the control group achieved the same level. This represents a significant increase in adherence following the intervention. Conversely, moderate adherence was observed in 16% of the experimental group compared to 30% of the

Table 1: Comparison of psychosocial factors between experimental and control groups after intervention

| Variable	Experimental group (*n*=50)	Control group (*n*=50)	*P*-value	Interpretation
Anxiety score (Mean±SD)	12.4±3.2	15.6±4.1	0.03	Significant reduction in anxiety
Depression score (Mean±SD)	10.1±2.8	13.8±3.5	0.02	Significant reduction in depression
Self-Esteem level (Mean±SD)	28.5±5.0	24.2±5.6	0.04	Significant improvement in self-esteem
Social support scale (Mean±SD)	35.2±6.1	30.8±6.7	0.01	Significant improvement in perceived support
Overall psychosocial adjustment (Mean±SD)	78.6±8.3	70.4±9.2	0.02	Significant overall improvement

SD: Standard deviation, *n*: Number of participants

Table 2: Comparison of medication adherence levels between experimental and control groups after intervention

Variable	Experimental group (*n*=50)	Control group (*n*=50)	*P*-value	Interpretation
High adherence (%)	80	52	0.03	Significant↑in adherence
Moderate adherence (%)	16	30	0.04	Significant↓in moderate adherence
Low adherence (%)	4	18	0.02	Significant↓in low adherence
Mean adherence Score (Mean±SD)	7.8±1.2	6.1±1.4	0.01	Significant improvement in medication adherence

SD: Standard deviation, *n*: NUMBER of participants
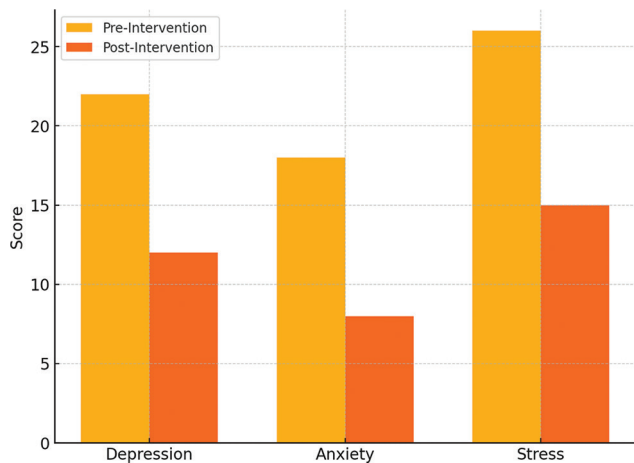
Figure 1: Depression, anxiety, and stress scores before and after intervention

Figure 2: Medication adherence level pre- and post-intervention

control group, showing a significant reduction in the proportion of participants with moderate adherence levels. Similarly, low adherence was markedly lower in the experimental group (4%) compared to the control group (18%), indicating a significant decline in poor adherence rates. The mean adherence score was also higher in the experimental group (7.8 ± 1.2) than in the control group (6.1 ± 1.4), suggesting an overall significant improvement in medication adherence among those who received the multifaceted therapeutic intervention.

Figure 2 illustrates the percentage distribution of participants according to their medication adherence levels before and after the implementation of a multifaceted therapeutic intervention. The yellow bars represent pre-intervention data, whereas the orange bars show post-intervention data. A clear improvement in medication adherence is evident following the intervention – High adherence: The percentage of participants with high adherence increased markedly from 30% pre-intervention to 60% post-intervention, indicating a substantial improvement in consistent medication-taking behavior. Medium adherence: Participants with medium adherence levels decreased from 45% before the intervention to 30% after, reflecting a positive shift toward higher adherence. Low adherence: The proportion of participants classified as having low adherence declined significantly from 25% pre-intervention to 10% post-intervention, showing a reduction in poor adherence patterns. Overall, the results demonstrate that the multifaceted therapeutic intervention led to a significant enhancement in medication adherence levels among participants. The increase
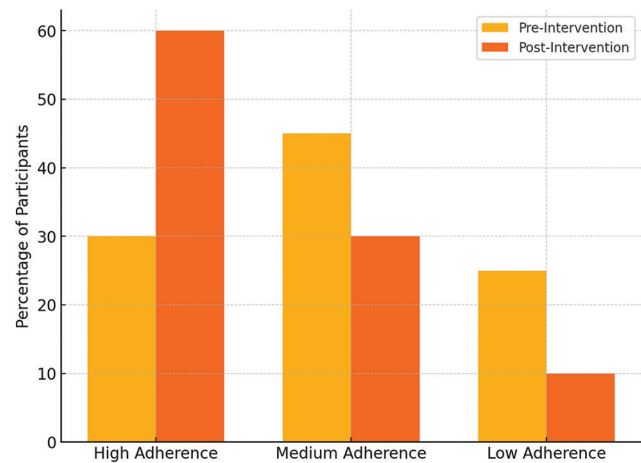
in high adherence and decrease in medium and low adherence categories suggest that the intervention effectively improved treatment compliance, which is likely to contribute to better post-transplant outcomes.

Table 3 demonstrated significant improvements across all lifestyle and quality of life measures in the experimental group compared to the control group: Dietary adherence was notably higher in the experimental group (8.2 ± 1.1) than in the control group (6.4 ± 1.5; *P* = 0.02), indicating that the intervention effectively promoted healthier eating practices. Physical activity levels also improved significantly (7.6 ± 1.3 vs. 5.9 ± 1.8; *P* = 0.01), suggesting that participants in the intervention group engaged in more consistent exercise routines. Sleep quality scores were higher among the experimental participants (7.9 ± 1.0) compared to the control group (6.2 ± 1.4; *P* = 0.03), reflecting better rest and recovery patterns. Stress management skills improved substantially in the experimental group (8.0 ± 1.2) relative to the control group (6.3 ± 1.6; *P* = 0.02), indicating enhanced coping and emotional regulation. Finally, the overall quality of life score was significantly greater in the experimental group (82.5 ± 7.8) than in the control group (70.6 ± 8.9; *P* = 0.01), showing a broad positive impact of the intervention on well-being. Overall, these findings indicate that the multifaceted therapeutic intervention significantly enhanced lifestyle behaviors and quality of life among single-organ transplant recipients. The improvements observed across multiple domains suggest that such interventions can play a vital role in promoting long-term health and psychological stability following transplantation.

Table 3: Comparison of lifestyle modifications and quality of life between experimental and control groups after intervention

| Variable	Experimental group (*n*=50)	Control group (*n*=50)	*P*-value	Interpretation
Dietary adherence (Mean±SD)	8.2±1.1	6.4±1.5	0.02	Significant improvement in dietary habits
Physical activity level (Mean±SD)	7.6±1.3	5.9±1.8	0.01	Significant increase in physical activity
Sleep quality (Mean±SD)	7.9±1.0	6.2±1.4	0.03	Significant enhancement in sleep quality
Stress management skills (Mean±SD)	8.0±1.2	6.3±1.6	0.02	Significant improvement in stress management
Overall quality of life score (Mean±SD)	82.5±7.8	70.6±8.9	0.01	Significant improvement in overall quality of life

SD: Standard deviation; *n*: Number of participants

Figure 3 presents the comparison of HRQOL among participants before and after the implementation of a multifaceted therapeutic intervention. HRQOL levels were categorized into good (<50), medium (50–100), and weak (>100), and the percentages of participants in each category were measured pre- and post-intervention. The results show a notable positive shift in HRQOL following the intervention – Good HRQOL: The proportion of participants reporting good HRQOL increased markedly from 10% before the intervention to 40% after the intervention, indicating a substantial enhancement in overall well-being. Medium HRQOL: The percentage of participants in the medium category remained stable at 50%, suggesting that while some individuals maintained moderate quality of life, others improved to the higher category.

Weak HRQOL: The proportion of participants with weak HRQOL decreased sharply from 40% pre-intervention to 10% post-intervention, reflecting a significant reduction in poor quality-of-life outcomes.

Overall, the post-intervention results reveal a significant improvement in HRQOL among participants. The increase in the "good" HRQOL category and the decrease in the "weak" HRQOL category indicate that the multifaceted therapeutic intervention effectively enhanced the physical, psychological, and social well-being of post-transplant recipients.

Table 4 shows that a significant association was found between the participants' place of residence and their medication adherence ($\chi^2 = 0.327$, $P = 0.04$). Participants from rural areas (58%) demonstrated greater improvement in medication adherence compared to their urban counterparts (42%). This finding suggests that rural transplant recipients benefited from stronger family involvement, closer community support, and higher motivation to adhere to treatment regimens due to limited access to specialized care. Conversely, urban participants exhibited lower adherence, possibly due to higher stress levels, work-related pressures, and reduced family engagement. These results underscore the importance of community- and family-based adherence interventions in rural populations and stress-management programs for urban patients. Age and psychosocial outcomes: The ANOVA test indicated a significant association between age group and the reduction in anxiety and depression scores (F = 12.4 ± 3.2, $P = 0.03$). Participants aged 20–40 years (36%) exhibited a greater decrease in anxiety and depression, reflecting better psychosocial adjustment compared to older participants
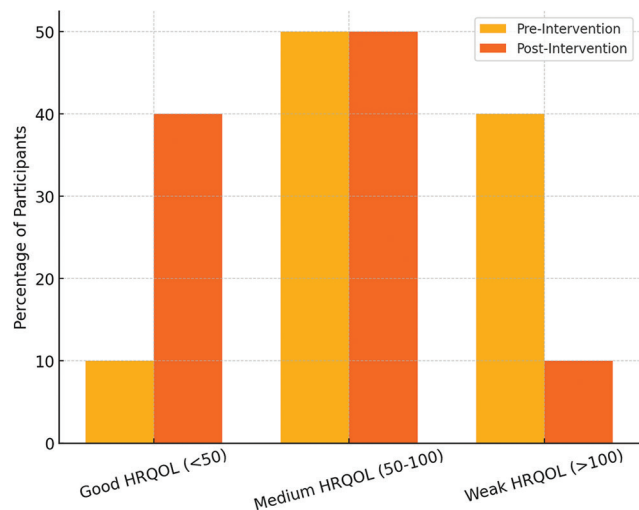
Figure 3: Health-related quality of life (HRQOL) pre- and post-intervention

(>50 years, 24%). Younger recipients were likely more adaptable, physically resilient, and optimistic about recovery, whereas older individuals experienced higher psychosocial stress due to comorbidities and reduced adaptability. This highlights the need for age-specific psychosocial interventions that provide additional emotional and cognitive support for older transplant recipients. Educational Attainment and HRQOL: Educational level was significantly associated with post-intervention HRQOL scores (F = 82.5 ± 7.8 Vs 70.6 ± 8.9, $P = 0.01$). Participants with college or higher education (48%) reported better HRQOL compared to those with primary or high school education (52%). Higher education likely contributed to greater health literacy, better understanding of medication regimens, and improved engagement in lifestyle modifications. Participants with lower educational attainment may have struggled with complex medical instructions, indicating a need for simplified educational materials and patient-tailored counseling to improve comprehension and adherence. Gender and Psychosocial Challenges: Although no statistically significant association was observed between gender and study outcomes, the data revealed that male participants (68%) represented the majority of transplant recipients. While outcomes did not differ significantly between genders, female participants (32%) tended to experience more psychosocial challenges, underscoring the importance of gender-sensitive care strategies and targeted

Table 4: Association between demographic variables and study outcomes (*n*=100)

Demographic variable	Category	*n* (%)	Associated study outcome	*P*-value	Statistical interpretation
Place of residence	Rural	58 (58)	Greater improvement in medication adherence	0.04	Significant association between rural residence and higher medication adherence
	Urban	42 (42)	Lower adherence levels	0.04	Urban participants showed comparatively lower adherence, possibly due to higher stress and less family involvement.
Age group (years)	20–40	36 (36)	Greater reduction in anxiety and depression scores	0.03	Significant improvement in psychosocial outcomes among younger participants
	41–50	40 (40)	Moderate improvement in psychosocial factors	0.03	Middle-aged participants showed moderate benefit
	>50	24 (24)	Lesser reduction in depression and anxiety	0.03	Older participants showed smaller psychosocial gains
Educational attainment	Primary/high School	52 (52)	Lower HRQOL scores post-intervention	0.01	Lower education is linked with reduced health literacy and HRQOL
	College and above	48 (48)	Higher post-intervention HRQOL	0.01	Significant positive association between education and HRQOL
Gender	Male	68 (68)	The majority of transplant recipients	NS	Reflects male predominance in transplant cases; no significant difference in outcomes
	Female	32 (32)	Faced more psychosocial challenges	NS	Indicates need for gender-sensitive post-transplant support
Marital status	Married	84 (84)	Better psychosocial adjustment and adherence	NS	Married participants benefited from family and spousal support
	Unmarried/widowed	16 (16)	Lower psychosocial scores	NS	Lesser support linked to poorer adjustment
Religion	Hindu	76 (76)	The majority group with strong family/religious support	—	Religion served as a psychosocial coping factor
	Others	24 (24)	Similar trend observed	—	Religious beliefs enhanced coping and recovery motivation
Occupation	Private sector	54 (54)	Moderate HRQOL; financial burden reported	NS	Employment status influenced post-transplant stress
	Government/other	46 (46)	Slightly higher HRQOL	NS	Job security and benefits improved outcomes
Monthly income (₹)	4001–8000	60 (60)	Moderate HRQOL; financial challenges noted	NS	Economic constraints influenced adherence and QoL
	>8000	40 (40)	Higher HRQOL and adherence	NS	Higher income facilitated better follow-up care
Comorbidities	Diabetes/hypertension present	64 (64)	Slightly lower HRQOL	NS	Chronic conditions affected the recovery pace
	None	36 (36)	Better overall outcomes	NS	Absence of comorbidities associated with improved QoL

QoL: Quality of life, HRQOL: Health-related quality of life

emotional support for female recipients to promote equitable recovery outcomes. Marital status and family support: Most participants were married (84%), and they demonstrated better psychosocial adjustment and adherence compared to unmarried or widowed participants (16%). Although the association was not statistically significant, the trend suggests that spousal and family support play a crucial role in emotional stability, medication adherence, and overall recovery after transplantation.

This finding aligns with previous evidence highlighting the value of family-based support systems in improving post-transplant outcomes. Religion and Coping Mechanisms: The majority of participants were Hindu (76%), and their religious beliefs appeared to serve as an important coping mechanism during the post-transplant period. Religious faith and community engagement may have enhanced emotional resilience, optimism, and adherence to lifestyle recommendations, though the association was descriptive rather than statistically tested. This indicates the potential benefit of integrating spiritual counseling and faith-based support into post-transplant rehabilitation programs. Occupation and Socioeconomic Stress: Occupational status did not show a statistically significant association with study outcomes. However, participants employed in the private sector (54%) reported moderate HRQOL and financial stress, whereas those in government or other sectors (46%) demonstrated slightly better HRQOL, likely due to greater job stability, healthcare benefits, and financial security. Employment support and financial counseling may therefore enhance the quality of life among economically vulnerable transplant recipients. Monthly income and HRQOL: Income level was not significantly associated with outcomes, but a trend was noted where participants earning more than ₹8000/month (40%) had higher HRQOL and adherence than those earning ₹4001–8000 (60%). Higher income likely facilitated better access to medications, follow-up care, and nutritious food, contributing to overall improved recovery. This highlights the importance of financial assistance programs and affordable healthcare access for low-income transplant recipients. Comorbidities

and recovery: While not statistically significant, participants with diabetes or hypertension (64%) showed slightly lower HRQOL compared to those without comorbidities (36%). Chronic health conditions may have complicated recovery and self-care adherence, emphasizing the need for comorbidity-specific management plans in transplant care protocols.

The study's findings revealed that demographic factors significantly influenced post-intervention outcomes among single-organ transplant recipients. Participants from rural areas demonstrated greater improvement in medication adherence compared to their urban counterparts ($P = 0.04$), possibly due to stronger family and community support systems and greater motivation to maintain graft function despite limited healthcare access. Younger participants (aged 20–40) showed a larger reduction in depression and anxiety scores than older groups ($P = 0.03$), suggesting that younger individuals possess greater psychological resilience, adaptability, and social support for coping with post-transplant challenges. Higher educational attainment was significantly associated with better post-intervention HRQOL scores ($P = 0.01$), reflecting the positive influence of education on health literacy, understanding of medical regimens, and adoption of healthy lifestyle behaviors. These findings align with previous research emphasizing that sociodemographic factors, particularly residence, age, and education, play a pivotal role in shaping psychosocial well-being, adherence behavior, and quality of life after transplantation, underscoring the need for tailored, context-specific interventions to optimize recovery outcomes across diverse patient populations.[13,14]

Discussion

This study found that a multifaceted therapeutic intervention markedly enhanced psychosocial well-being, medication adherence, and overall HRQOL among single-organ transplant recipients in Kerala.[15] These improvements, reflected across emotional, behavioral, and functional domains, indicate that integrated care models effectively address the complex challenges faced by transplant patients.[16] The findings parallel international evidence demonstrating that combined psychosocial and behavioral interventions improve post-transplant outcomes and graft survival, as shown in studies from the UK, Australia, and the US, where structured counseling and adherence-focused programs significantly reduced psychological distress and improved long-term adherence.[17] The study reinforces the central role of nurses in delivering holistic, patient-centered support through counseling, motivation enhancement, and lifestyle guidance.[18] It also highlights the need for institutional policies that integrate psychosocial assessment, adherence monitoring, and lifestyle education into routine transplant care.[19] Although limited by purposive sampling and a short follow-up, the study's design and validated measures strengthen its contributions. Future research should include multicentric, longitudinal studies and explore mHealth and tele-counseling innovations to support sustained behavioral change and broaden access to comprehensive post-transplant care.

Conclusion

This study assessed a multifaceted intervention – consisting of psychosocial support, medication counseling, and lifestyle education – among single-organ transplant recipients in Kerala using a prospective pre-test post-test control group design. The intervention led to significant improvements in psychosocial well-being, medication adherence, and HRQOL, as shown by reductions in DASS-21 depression, anxiety, and stress scores and increases in MARS and SF-36 scores. These findings highlight the importance of integrating structured psychosocial and behavioral support into routine post-transplant care. Healthcare institutions are encouraged to adopt such programs and strengthen screening and nurse training. Further research using multicentric or longitudinal approaches, including digital and telehealth-based platforms, is recommended to ensure sustained support post-transplant.

Acknowledgment

Conflict of Interest

Funding Source

References

1. Shi YX, Liu CX, Liu F, Zhang HM, Yu MM, Jin YH, *et al*. Efficacy of adherence-enhancing interventions for immunosuppressive therapy in solid organ transplant recipients: A systematic review and meta-analysis based on randomized controlled trials. Front Pharmacol 2020;11:578887.
2. Lee H, Shin BC, Seo JM. Effectiveness of eHealth interventions for improving medication adherence of organ transplant patients: A systematic review and meta-analysis. PLoS One 2020;15:e0241857.
3. De Bleser L, Matteson M, Dobbels F, Russell C, De Geest S. Interventions to improve medication-adherence after transplantation: A systematic review. Transpl Int 2009;22:780-97.
4. Yoon ES, Hur S, Curtis LM, Wynia AH, Zheng P, Nair SS, *et al*. A multifaceted intervention to improve medication adherence in kidney transplant recipients: An exploratory analysis of the fidelity of the TAKE IT trial. JMIR Form Res 2022;6:e27277.
5. Mellon L, Doyle F, Hickey A, Ward KD, De Freitas DG, McCormick PA, *et al*. Interventions for increasing immunosuppressant medication adherence in solid organ transplant recipients. Cochrane Database Syst Rev 2022;9:CD012854.
6. Abtahi H, Safdari R, Gholamzadeh M. Pragmatic solutions to enhance self-management skills in solid organ transplant patients: Systematic review and thematic analysis. BMC Primary Care 2022;23:166.
7. Jobst S, Stadelmaier J, Zöller P, Grummich K, Schmucker C, Wünsch A, *et al*. Self-management in adults after solid-organ transplantation: A scoping review protocol. BMJ Open 2023;13:e064347.
8. Ng YH, Litvinovich I, Leyva Y, Ford CG, Zhu Y, Kendall K, *et al*. Medication healthcare follow-up and lifestyle nonadherence: do they

share the same risk factors? Transplant Direct 2022;8:e1256.

9. Divyaveer S, Nagral S, Prasad KT, Sharma A, Jha V. Health system building blocks and organ transplantation in India. Transplantation 2021;105:1631-4.

10. The Lancet Regional Health-Southeast Asia. Organ transplantation in India: Needs a bigger push. Lancet Reg Health-Southeast Asia 2024;21:100366.

11. Divdar Z, Foroughameri G, Farokhzadian J. The psychosocial needs and quality of life of family caregivers of patients with organ transplant. J Res Nurs 2019;24:344-55.

12. Al-Beashi MS, Almutairi LA, Albashi KM, Alharbi LM, Altowayan DR, Alkuraidees AM, *et al*. The role of nursing in the multidisciplinary team approach to care of liver transplant patients: A comprehensive review. J Int Crisis Risk Commun Res 2024;7:2512.

13. Walker LO, Avant KC. Strategies for Theory Construction in Nursing. Vol. 4. Upper Saddle River NJ: Pearson/Prentice Hall; 2005.

14. Becker MH. The health belief model and personal health behavior. Health Educ Monogr 1974;2:324-473.

15. Dew MA, Switzer GE, DiMartini AF, Matukaitis J, Fitzgerald MG, Kormos RL. Psychosocial assessments and outcomes in organ transplantation. Prog Transplant 2000;10:239-59; quiz 260-1.

16. Chisholm MA. Enhancing transplant patients' adherence to medication therapy. Clin Transplant 2002;16:30-8.

17. Bhat M, Usmani SE, Azhie A, Woo M. Metabolic consequences of solid organ transplantation. Endocr Rev 2021;42:171-97.

18. Kute VB, Kumar A, Yadav AK, Pradhan SS, Arora S, Sunthlia A, *et al*. Challenges and Solutions for Transplantation in Northeast India: Proceedings of the National Organ and Tissue Organization Session at the India Society of Organ Transplantation 2023 Meeting in Kolkata; 2025.

19. Rahimi M, Nasiri Toosi M, Gorgi E, Mirzaei A. Association between negative emotional states self-regulation skills and immunosuppressive medication adherence in liver or kidney transplant recipients: A cross-sectional study. BMC Public Health 2025;25:3993.