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Examining the Relationship Between Healthy Life Awareness and Psychological Well-Being in Liver Transplantation Patients: A Structural Equation Model

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ABSTRACT

This study aimed to evaluate the mediating role of healthy life awareness in the relationship between the sociodemographic characteristics and psychological well-being of liver transplant patients. The sample of the study consisted of 202 patients aged between 18 and 69 years who underwent liver transplantation surgery at a hospital in Turkey. The data were collected using a sociodemographic information form, the "Healthy Life Awareness Scale" and the "Psychological Well-Being Scale." Healthy life awareness directly predicted psychological well-being (β: 0.68, $p < 0.01$). Education positively predicted psychological well-being both directly (β: 0.14, $p < 0.05$) and indirectly through healthy life awareness (β: 0.76, $p < 0.05$). Age indirectly predicted healthy life awareness and psychological well-being through employment status and education. The income level positively predicted healthy life awareness (β: 0.14, $p < 0.05$), whereas gender (male) negatively predicted healthy life awareness (β: −0.22, $p < 0.01$). Healthy life awareness was a significant predictor of psychological well-being. The results of this study may offer valuable information for healthcare providers to tailor interventions that also support mental and emotional health, which is critical to the long-term success of transplant outcomes.

1 | Introduction

End-stage liver disease is a typically irreversible condition caused by liver failure (Peng et al. 2019). This disease leads to severe physical and psychological issues for individuals (Donlan et al. 2021). Since the liver becomes incapable of performing its functions, and no other medical solutions are viable, liver transplantation, considered the "Gold Standard," is recommended for end-stage liver failure (Dąbrowska-Bender et al. 2018). There is an increasing global trend in liver transplantation rates each year. According to the Global Observatory on Donation and Transplantation (GODT) (2022) data, 37 436 liver transplants were performed in 2022, representing a 24% increase from 2021. Along with the rise in liver transplantation rates, postoperative survival rates have also improved. According to the European Liver Transplant Registry (ELTR), the one-year and five-year

patient survival rates after liver transplantation were 83% and 71% between 1968 and 2016, respectively (Adam et al. 2018), while the one-year survival rate in Turkey was 85% (Turkish Society of Transplant Coordinators 2013). This success in transplantation is related to recipient and donor compatibility, advancements and experience in surgery, immunosuppressive drugs, and postoperative complication management (Poggio et al. 2021).

Complications after liver transplantation include physiological issues such as rejection, infection, de novo malignancy, cardiovascular risk factors, metabolic syndrome, medical noncompliance, recurrence of liver disease, and neurological complications (Czarnecka et al. 2024). Additionally, patients may face psychosocial problems. Due to changes in body image, the long and challenging treatment process, immunosuppressive and steroid

Summary

- This study is the first to demonstrate relationships between sociodemographic data, healthy life awareness (HLA), and psychological well-being (PWB) in liver transplant patients.

- HLA acts as a mediator that positively affects PWB and resilience, which may enable liver transplant patients to better manage posttransplant complications, adhere to treatments and maintain their overall health.

- The model established between HLA and PWB can contribute to the development of innovative and personalized psychosocial interventions for patients after transplantation.

therapy, the risk of disease recurrence, job loss, social isolation, and fear of death, patients may experience anger, stress, anxiety, and depression (Khoddam and Wellisch 2019). It is very important to gain healthy lifestyle behaviors both in the management of complications and in maintaining psychosocial well-being after surgery.

A healthy lifestyle refers to the control of behaviors that can affect one's health and the development behaviors appropriate to one's current health status while organizing activities of daily living. Another definition describes a healthy lifestyle as the practices individuals engage in to stay healthy and prevent diseases (WHO 2020). It includes behaviors such as taking responsibility for health, self-realization, monitoring and follow-ups, recognizing bodily changes, stress management, balanced nutrition, avoiding smoking and alcohol, and regular exercise (Buecker et al. 2020; Das et al. 2020). After transplantation surgery, it is important for patients to eat according to their recommended diet, exercise, recognize the changes in their body (signs of rejection, side effects of drugs in the body), maintain psychological well-being (PWB), improve potential health, and increase their quality of life (Hu et al. 2020). Moderate posttransplantation exercise programs were reported to reduce cardiovascular and metabolic risks (De Smet et al. 2022; Dunn et al. 2020). After transplantation, regular exercise not only benefits physical health but also provides behavioral support in reducing depression and anxiety rates (Neale, Smith, and Bishop 2017). Furthermore, lifestyle changes such as adequate and balanced nutrition, regular physical activity, stress management, and quality sleep significantly affect the health and quality of life of postliver transplant patients (Dąbrowska-Bender, Michałowicz, and Pączek 2016; Hreńczuk et al. 2018).

It was reported in a previous study that the majority of liver transplant patients engage in insufficient physical activity or are entirely sedentary. The study also revealed that inactivity increased after surgery, and there were strong relationships between inactivity, unhealthy diets, and quality of life (Gitto et al. 2023). Another study showed that the adherence of patients to immunosuppressive medications as prescribed, the monitoring of complications, collaboration with physicians, changes

in unhealthy lifestyles, and focus on interests were effective in managing the side effects of the disease and lowering repeated hospital visits and healthcare costs (Issa and Alkhouri 2015). Some subjective characteristics of patients can facilitate coping with the requirements of treatment (Mierzyńska et al. 2021). Adherence to health-promoting behaviors is conditioned by certain sociodemographic variables. Gender, education level, and occupational status significantly influence the implementation of health-related activities (Hreńczuk et al. 2018). It was found that university graduates had healthier diets after liver transplantation (Hreńczuk et al. 2018). Another study showed age to be a predictor of valuing health among transplant patients (Mierzyńska et al. 2021).

In the literature, several studies have examined the relationships between sociodemographic data and healthy lifestyles, health literacy, well-being, and health-related quality of life using structural equation modeling (SEM) (Amoah 2018; Hwang, Kim, and Min 2021; Wang et al. 2020). However, to our knowledge, no studies have examined the relationships between sociodemographic data, HLA, and PWB using structural equation modeling (SEM) in transplant patients. Psychological resilience, quality of life, and healthy lifestyle behaviors in transplant patients have mostly been addressed separately in different studies (Hreńczuk et al. 2018; Gultekin, Kavak, and Ozdemir 2019; Girgenti et al. 2020), and studies systematically examining the relationships between these factors have been limited. Nevertheless, current findings show that healthy lifestyle behaviors have a direct effect on PWB and resilience. Gaining or maintaining healthy lifestyle behaviors requires a different path for each patient. For example, while quitting negative habits such as smoking may be a primary goal for one patient, incorporating regular exercise into their daily routine may be important for another.

Individual differences in this process should be addressed, especially by taking into account sociodemographic characteristics. Factors such as income level, employment status, cultural background, and current life habits significantly affect HLA and behaviors. Therefore, gaining HLA with strategies adapted to each patient's own conditions not only supports positive care outcomes but also increases PWB. This approach offers a comprehensive strategy that can improve long-term health outcomes for liver transplant patients. This study aims to develop and test a hypothetical model for the relationships between sociodemographic characteristics, HLA, and PWB.

This model may offer surgical nurses, who spend the most time with patients during the transplantation process in clinics, the opportunity to create a personal plan for care with consultation-liaison psychiatry nurses. Nurses play crucial roles in developing healthy lifestyle behaviors in patients, such as posttransplant disease management, exercising, balanced nutrition, psychological development, interpersonal relationships, and stress management (Gezginci et al. 2019). The PWB of patients after surgery is important for their recovery and quality of life. Therefore, this study is noteworthy for examining the relationships between sociodemographic data, HLA, and PWB.

2 | Method

2.1 | Research Design

This study primarily aimed to identify the relationships between sociodemographic factors, HLA, and PWB. The second aim was to explain these relationships by exploring the mediating effects of HLA. This study utilized a cross-sectional, descriptive, and correlational design to achieve these objectives. SEM was chosen as a method due to its ability to simultaneously estimate structural relationships between multiple independent and dependent variables and identify direct, indirect, and total effects among variables (Kim et al. 2017). This feature of SEM allows us to provide more comprehensive answers to research questions in areas involving multifactorial and interrelated variables, such as nursing. Additionally, SEM provides a deeper understanding of the cause–effect relationships between variables. By including this method in our study, we aimed to contribute to the better understanding of the method by readers in the field of nursing.

2.2 | Data Collection

This study was conducted between September 2023 and February 2024 at İnönü University Liver Institute in Turkey. The inclusion criteria were as follows: being an adult aged 18 years who understands the purpose of the study, (1) having undergone successful liver transplant surgery at least 1 year ago, (2) being able to read, write, and understand Turkish, and (3) agreeing to participate in the study.

Participants with psychiatric disorders were excluded because they had the risk of not providing reliable and valid results with the PWB scale, which is the main focus of our study. The G*Power 3.1.9.7 program was used for sample size calculation. Since there was no study in the literature examining the relationship between HLA and PWB similar to our study, we used a medium effect size, as suggested by Cohen, in the sample calculation process. In this context, by taking a medium effect size of 0.15, 95% power, a 95% confidence interval, and 5% margin of error, the minimum required sample size was found to be 153. Data were collected from 208 participants. Participants were selected using the convenience sampling method. They were asked to consent to participate in the study, and all provided informed consent. Before six participants were excluded due to missing questionnaires, the study was completed with 202 participants. The data were collected during the outpatient clinic visits of the participants. The clinic nurse asked those who agreed to participate in the study to complete the questionnaires, which took approximately 20 min.

2.3 | Measures

2.3.1 | Sociodemographic Characteristics

Previous SEM studies have shown that sociodemographic variables, including gender, age, marital status, education level, and income, are associated with an individual's HLA levels and healthy lifestyle behaviors. Therefore, the age, gender, education, income level, marital occupation, and employment status of the participants were recorded (Amoah 2018; Paterson et al. 2018; Hwang, Kim, and Min 2021). These variables are also known to shape health and PWB (Mccracken and Phillips 2017; Amoah 2018).

2.3.2 | HLA Scale

The HLA scale was validated and tested for reliability in Turkish by Özer and Yilmaz (2020). The scale consists of 15 items and 4 subscales: socialization, responsibility, changing, and nutrition. It is used to determine the HLA levels of individuals and take necessary measures based on the results in health-related and social fields. This is a 5-point Likert-type scale, with a score range of 15–75. Higher scores indicate higher levels of HLA. In the study conducted by Özer and Yilmaz (2020) with two different groups, Cronbach's alpha values of the scale were reported as 0.81 and 0.82, while in this study, the Cronbach's alpha coefficient was 0.96.

2.3.3 | Psychological Well-Being Scale

The PWB scale was developed by Diener et al. (2009) and validated in Turkish by Telef (2013). The scale includes important elements such as positive relationships, a sense of competence, and having a meaningful and purposeful life. It consists of eight items rated on a 1–7 scale, with response options varying from strongly disagree (1) to strongly agree (7). Total scale scores range from 7 to 56, where higher scores indicate that the individual possesses abundant psychological resources and strengths. In Telef's (2013) study, Cronbach's alpha coefficient for the scale was reported as 0.87. In this study, this value was calculated as 0.95.

2.3.4 | Statistical Analysis

The descriptive analyses of the sociodemographic data were conducted using SPSS 26.0. The variance inflation factor (VIF) for each variable was found to be less than 5, and the bivariate correlation did not exceed 0.80, indicating no multicollinearity and that the assumption of mutual independence was not violated. Additionally, skewness and kurtosis coefficients between −2 and +2 confirmed that the data met the assumption of normal distribution.

Based on previous studies on HLA, PWB, and sociodemographic data using SEM, the original SEM was developed considering age, gender, education, income level, and employment status as exogenous variables (Amoah 2018; Paterson et al. 2018; Hwang, Kim, and Min 2021). HLA was used as a mediating variable, and PWB was the endogenous variable. A path (mediation) analysis within SEM was performed to test the relationships between sociodemographic characteristics, HLA, and PWB. Model parameters were estimated using the maximum likelihood method. Standardized regression coefficients were used to evaluate the effects of sociodemographic variables and HLA on PWB in the path model.

The overall fit of the model was assessed using CMIN/DF, comparative fit index (CFI), goodness-of-fit index (GFI), and root

mean square error of approximation (RMSEA) values. The model was considered acceptable when CFI values were greater than 0.90, GFI values were greater than 0.85, RMSEA values were smaller than 0.08, and CMIN/DF values were smaller than 3 (Karagöz 2019). Additionally, Tucker-Lewis index (TLI), normed fit index (NFI), relative fit index (RFI), and incremental fit index (IFI) values were calculated. Insignificant paths were trimmed to adjust the path model until the main GFIs indicated that the final model fit the data appropriately. Direct and indirect effects between variables were calculated by decomposing the path analysis effects. Path analysis, including the estimation of path coefficients and evaluation of the overall fit of the structural model, was conducted using SPSS AMOS version 24. A p-value smaller than 0.05 was considered statistically significant.

2.3.5 | Ethical Approval

Ethical approval to conduct the study was obtained from the Scientific Research and Publication Ethics Committee of Kahramanmaraş İstiklal University, with the decision numbered E-23430505-050.01.04-20479 and dated August 31, 2023, while institutional permission was obtained from the facility where the research was conducted. The protocols of the study adhered to the principles of the Declaration of Helsinki throughout the entire process. The participants were informed that they could withdraw from the study at any stage. It was emphasized to participants that the results of the study would be published for scientific purposes without any identifying information.

3 | Results

While the sample of the study initially included 208 participants, 202 provided valid responses. The ages of the participants ranged from 20 to 69 years. Among the participants, 135 were male (66.8%), 170 (84.2%) were married, 62 (30.7%) had education levels of primary school or below, and 76 (37.6%) had completed high school. Additionally, the participants included laborers (16.8%), civil servants (13.4%), retired individuals (34.2%), and self-employed workers (17.4%). The majority of the participants (54.0%) reported that their monthly income was equal to their expenses. Ninety-nine (49%) of the participants reported that they lived in the city center, and 102 (50.5%) reported they had undergone their surgeries 1 year ago. All participants had received transplants from living donors. The participants had a mean HLA scale score of 37.99 ± 8.06 and a mean the PWB scale score of 33.32 ± 8.07. The sociodemographic characteristics of the participants are presented in Table 1.

The HLA scale demonstrated adequate internal consistency and construct validity, with a Cronbach's alpha coefficient of 0.96. The confirmatory factor analysis of HLA indicated that the data fit the hypothetical model well, with the following indices: CMIN/DF = 2.255, GFI = 0.887, NFI = 0.940, RFI = 0.924, IFI = 0.966, TLI = 0.956, CFI = 0.966, and RMSEA = 0.079 (Byrne 2013; Arbuckle 2012). Moreover, the PWB scale demonstrated good internal consistency with a Cronbach's alpha coefficient of 0.95 and sufficient construct validity with the following indices: CMIN/

TABLE 1 | Descriptive statistics of the participants ($N = 202$).

Variables	N (%)	$\bar{x}$	SD(standard deviation)
Age			
20–30	1 (5%)		
30–40	11 (5.4%)		
40–50	46 (22.8%)		
50–60	75 (37.1%)		
60–70	69 (34.2%)		
Gender			
Male	135 (66.8%)		
Female	67 (33.2%)		
Marital status			
Unmarried	32 (15.8%)		
Married	170 (84.2%)		
Education			
Primary school or below	62 (30.7%)		
Junior high school	28 (13.9%)		
High school	76 (37.6%)		
Bachelor	30 (14.9%)		
Master's/PhD graduate	6 (3%)		
Occupation			
Unemployed	37 (18.3%)		
Civil Servants	34 (16.8%)		
Worker	27 (13.4%)		
Retired	69 (34.2%)		
Freelancer	35 (17.4%)		
Income			
Low	84 (41.6%)		
Equal	109 (54.0%)		
Higher	9 (4.4%)		
Location of resident			
Urban	99 (49%)		
District	95 (47%)		
Rural	8 (4%)		
Time since transplant (years)			
1 year	102 (50.5%)		
2 years	57 (28.2%)		
3 years	30 (14.9%)		

(Continues)

TABLE 1 | (Continued)

Variables	N (%)	$\bar{x}$	SD(standard deviation)
4 years	11 (5.4%)		
5 years	2 (1%)		
Healthy life awareness		37.99	8.06
Psychological well-being		33.32	8.07

DF = 1.380, GFI = 0.968, NFI = 0.983, RFI = 0.976, IFI = 0.995, TLI = 0.993, CFI = 0.995, and RMSEA = 0.043.

The bivariate correlation matrix showed that HLA and PWB were significantly associated with all variables included in the model (Table 2). The model revealed a high-positive correlation between HLA and PWB ($r = 0.75$, $p < 0.01$). Education showed a moderate-positive correlation with both HLA ($r = 0.64$, $p < 0.01$) and PWB ($r = 0.58$, $p < 0.01$). There were also positive correlations between income and HLA ($r = 0.35$, $p < 0.01$) and between income and PWB ($r = 0.37$, $p < 0.01$). There were weak-negative relationships between age and HLA ($r = -0.22$, $p < 0.01$) and between age and PWB ($r = -0.26$, $p < 0.01$).

3.1 | Structural Equation Model

Based on the results of initial analyses, we developed a structural equation model to examine the relationships between sociodemographic indicators, HLA, and PWB. The final model achieved the best fit with the data after removing insignificant paths and those violating the hypothesis. The developed structural equation model was significant for all parameters ($p < 0.05$ or $p < 0.01$). This model also demonstrated good fit with the data: $\chi^2 = 233.901$, df = 111, CMIN/DF = 2.107, $p < 0.001$, CFI = 0.957, TLI = 0.948, GFI = 0.881, NFI = 0.922, RFI = 0.905, IFI = 0.958, and RMSEA = 0.074 (Figure 1). As shown in Table 3 and Figure 1, HLA directly predicted PWB (β: 0.68, $p < 0.01$). Education directly predicted PWB (β: 0.14, $p < 0.05$) and positively predicted it through HLA (β: 0.76, $p < 0.01$). Gender (male) negatively predicted HLA (β: −0.22, $p < 0.01$). Occupation and marital status were excluded from the model, as they did not show any significant relationship to HLA and PWB. Age indirectly predicted HLA and PWB through employment status and education. Income positively predicted HLA (β: 0.14, $p < 0.05$). Consistent with the hypothesis, sociodemographic variables (gender, employment status, education, and income level) indirectly predicted PWB through HLA. According to the structural equation model, the predictors explained 60.8% of the total variance in PWB.

4 | Discussion

The results of this study demonstrated that sociodemographic indicators and HLA were significant predictive factors of PWB. PWB was significantly related to both demographic characteristics and HLA, and these two predictors explained 60.8% of the total variance in PWB. Furthermore, education had a direct effect on PWB, whereas age did not have a direct effect on either HLA or PWB.

Among the sociodemographic characteristics of liver transplant recipients, education is a significant positive factor in the choice of healthy living behaviors (Aguiar et al. 2015; Hreńczuk et al. 2018). Consistent with the literature, the results of this study indicated that education was positively associated with healthy living behaviors and PWB (Hreńczuk et al. 2018; Sarıtaş et al. 2024). The results of the study also demonstrated that education level was related to PWB among the participants. However, a contrasting study suggested that higher education levels were associated with increased feelings of stigmatization, and thus, negatively related to PWB (Aguiar et al. 2015). The discrepancy in results across studies may be attributed to differences in the societies, cultures, and perceptions of illness/health in the context in which these studies were conducted.

"Returning to normal life" or "achieving a healthy life" after liver transplantation involves significant challenges (Ladner et al. 2015; Hickman et al. 2019). Conversely, a study in Belgium showed that liver transplant recipients improved in terms of physical exercise over time but required long-term psychotherapy for mental health (Onghena et al. 2016). A study in the United States demonstrated that liver transplant recipients received psychological health-related motivation training to regain "normal functions" through healthy exercises (Lai et al. 2018). In another study, which was conducted in North Carolina, it was reported that liver transplant recipients should transition to a "new normal life or healthy living" rather than returning to "normal life." The results of the qualitative study emphasized the positive relationship between a new normal life and mental health, particularly noting that psychological states in the third and sixth months postsurgery significantly affected the return to healthy living. The same study also highlighted the potential effectiveness of psychosocial interventions (Lieber et al. 2021). In another study on liver recipients, the researchers found that after 20 years of follow-up, PWB was aligned with physiological health patterns (Duffy et al. 2010). In the literature, long- and short-term follow-ups after transplantation have not negated the relationship between PWB and HLA. The results of this study demonstrated that HLA levels were good predictors of PWB. The similarity of our results to the literature on the positive relationship between HLA and PWB suggests a universal relationship between HLA and PWB in liver transplant recipients across cultures. These results indicate that posttransplantation nurses should implement care protocols that integrate surgical and psychosocial care/intervention programs. Nurses can conduct single or group training activities to tailor nursing interventions to the needs of each individual. Nursing interventions can ensure PWB, the acquisition of HLA, and their mutual complementarity and monitoring, particularly after transplantation. Nurses can integrate interventions that improve HLA into individual psychosocial intervention programs. Especially with motivational interviewing and awareness programs, they can develop interventions that fit their protocols but are unique for the individual (Varshney, Dhingra, and Choudhury 2024; EXALT 2024).

In this study, age had a negative effect on education levels and a positive effect on employment status. This indicated that as the

TABLE 2 | Spearman's Correlation between variables.

	HLA	PWB	Age	Gender	Education	Employment	Income
HLA	1						
PWB	0.758[b]	1					
Age	−0.229[b]	−0.261[b]	1				
Gender	−0.118	−0.097	0.131	1			
Education	0.649[b]	0.580[b]	−0.400[b]	0.189[b]	1		
Employment	−0.086	−0.132	0.491[b]	−0.263[b]	−0.388[b]	1	
Income	0.358[b]	0.378[b]	−0.208[b]	−0.146[a]	0.360[b]	−0.258[b]	1

[a]Correlation is significant at the 0.05 level (2-tailed).
[b]Correlation is significant at the 0.01 level (2-tailed).
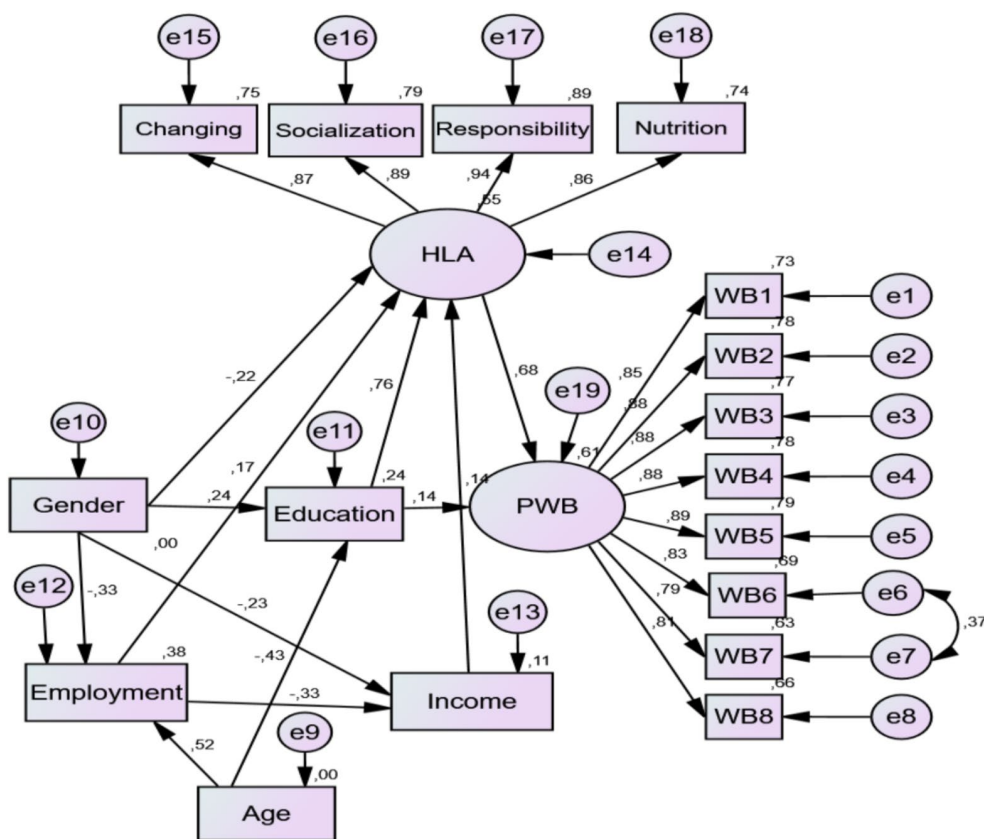
FIGURE 1 | Model of relationship between sociodemographic characteristics, healthy life awareness, and psychological well-being. $N = 202$, Estimates are based on standardized regression coefficients.

participants aged, their education levels decreased, while their participation in the workforce increased. Besides, education was a significant predictor of both HLA and PWB. This may be because a higher education level can enhance the ability of the person to read, analyze, and comprehend information, aiding them in making more informed decisions about healthy living choices. Consequently, individuals can be more conscious about healthy eating, exercise, and stress management (Edelman and Kudzma 2021; Cassidy 2022). In a study in Italy, it was reported that elderly liver transplant patients had more positive psychological outcomes than younger ones due to their potentially longer relative life expectancy. However, this could change when education levels were considered (Cucchetti et al. 2015).

Similarly, a study in Poland revealed that young liver transplant patients felt more depressed and had lower levels of perceived support. In the same study, the authors found that elderly individuals with lower education levels also had higher levels of depressive symptoms, similar to younger individuals (Kisielska et al. 2022). Neuberger (2020) reported that age was related to healthy daily life outcomes in liver transplant patients, suggesting positive results in terms of age and returning to a healthy life and psychological outcomes.

In our study, income and employment status positively predicted HLA, and they indirectly predicted PWB through HLA. Posttransplant employment can signify a good and healthy life

TABLE 3 | Indirect pathways in the final model.

			Unstandardized coefficient estimate	Standardized coefficient estimate	SE	CR	*p*
HLA	←	Income	0.76	0.139	0.292	2.603	0.009
HLA	←	Employment	0.922	0.169	0.315	2.922	0.003
HLA	←	Education	1.853	0.761	0.148	12.511	***
HLA	←	Gender	−1.471	−0.224	0.366	−4.014	***
PWB	←	Education	0.109	0.144	0.05	2.193	0.028
PWB	←	HLA	0.21	0.677	0.024	8.753	***

Abbreviations: SE, standard error; CR, critical ratio.
***$p < 0.05$.

by enabling a return to work and a stable income. In particular, a high income can be partially associated with healthy lifestyle behaviors. Onghena et al. conducted a study on quality of life and liver transplantation and highlighted that liver transplantation impeded employment, adversely affecting quality of life in physical and psychological dimensions. The authors also noted the increased psychosocial burden in these patients, who had to retire early. In the same study, it was explained that within 2 years, quality of life, including physical and psychological aspects, improved as these patients returned to work and became more active in social life (Onghena et al. 2016). In a study in Taiwan, older age and associated unemployment (nonworking status) worsened psychosocial outcomes in liver transplant patients (Chen et al. 2020). The educational status of working liver transplant patients has been shown to be a significant explanatory factor for return to healthy living and positive psychological outcomes in various studies (Onghena et al. 2016; Jadlowiec and Taner 2016; Chen et al. 2020).

The results of this study pointed out that gender, employment status, education, and income level significantly explained PWB through the mediation of HLA. The relationships between education, employment status, and income levels and a return to healthy living and PWB have been reported in the literature (Onghena et al. 2016; Jadlowiec and Taner 2016; Chen et al. 2020; Kisielska et al. 2022), but the relationships between gender, returning to a healthy life/gaining a healthy lifestyle after surgery, and PWB that were identified in this study were noteworthy (Nephew et al. 2017; Cullaro, Sarkar, and Lai 2017). In a study in Michigan, female liver transplant patients reported more psychological and financial problems and unemployment. The results of the same study suggested that women waited longer on the transplant list for various reasons, which could have negatively affected their psychological outcomes or healthy living behaviors after transplantation (Mcelroy et al. 2020). On the other hand, the norms imposed by societies on men may discourage them from engaging in healthy behaviors, potentially leading to poorer health outcomes compared to women (Fleming and Agnew-Brune 2015). Another perspective considers the impact of men's negative health behaviors, such as smoking and alcohol consumption, on posttransplant outcomes (Nielsen et al. 2021). Despite women's general health consciousness, studies suggest that female transplant recipients experience higher symptom burdens and lower quality of life compared to men (Zead, Ismail, and El-Khashab 2021). On the other hand,

the limitations in women's access to the health system or their support mechanisms affect their awareness levels and health behaviors (Mcelroy et al. 2020). Another important issue is that men lead a more sedentary life and consume high-calorie foods compared to women (Feraco et al. 2024). This information reveals that gender norms across the globe impact healthy living behaviors following transplant surgery. Especially in terms of the place where the study was conducted, the continuation of excessive eating habits in men after transplantation is perceived as "continuing to be healthy and displaying masculine characteristics." Women were willing to follow the preventive recommendations of doctors and nurses to maintain their health, whereas men did not think this was a requirement. This cultural issue within the population could potentially explain the differences in results between genders in the study. According to this information, while surgical nurses are responsible for providing basic surgical care requirements before, during, and after transplantation and education on healthy living behaviors that need to be acquired in the long term, psychiatric nurses are responsible for providing awareness about healthy living behaviors that may vary depending on the gender perceptions of the culture.

It is important to consider cultural differences to ensure the wider applicability of the findings obtained in this study. For example, the importance of education and income for healthy lifestyle behaviors may differ between high-income countries with minimal problems in access to healthcare and low-income countries where there are structural barriers to accessing healthcare. Similarly, varying cultural norms regarding aging and health responsibilities may influence the impact of demographic variables such as age or employment status on health behaviors and outcomes (Thomas and Leon 2021). According to Gökçek and Temiz (2023), in the society where this study took place, women exhibited higher rates of depressive characteristics, and their low levels of income significantly impacted their PWB compared to other segments of society. A study in the United States focused on the compliance of male and female individuals with healthy living recommendations and their quality of life after liver transplantation, reporting the results of prospective data in three different time periods as follows: "Women and men do not have the same level of quality of life after transplantation because their choices related to healthy living are different" (Cowling et al. 2004). This implies that universal gender characteristics may contribute to gender differences in posttransplantation wellness. All these gender-based posttransplantation

differences raise some important questions for future studies. In particular, the chances of poor women living in low-income countries to lead a healthy life and improve their PWB, even if they have access to liver transplantation, constitute an important research topic.

The positive relationship between HLA and PWB highlighted in this study has also been emphasized in the literature (Broschewitz et al. 2017; Hickman et al. 2019; Golfieri et al. 2019). Returning to healthy living results in maintaining and improving mental status and enhancing positive psychological effects (Broschewitz et al. 2017; Hickman et al. 2019).

4.1 | Limitations and Strengths

Since this study describes a cross-sectional group, its results may not be generalizable to larger groups. Conducting the study in a specific socioeconomic-cultural group may only provide results applicable to that region, offering limited data for universal outcomes. Another important limitation is that only literate people were included in the study, and information about the religious beliefs and ethnicity characteristics of the participants was not collected. Nonetheless, considering sociodemographic variables and culture, this study provides foundational information for new care protocols in the region where it was conducted, and it is considered to have significant outcomes in this context.

5 | Relevance for Clinical Practice

The results of this study indicated that the HLA and PWB levels of liver transplant recipients which are documented in the literature as changes that may arise in the short or long term, are affected by various sociodemographic variables. To enhance the positive outcomes of this effect, it may be important to ensure collaboration between surgical nurses and consultation-liaison psychiatry nurses from the first moment of hospitalization of liver transplant recipients. Especially the positive relationship between HLA and PWB may require collaboration for the long- and short-term planning of postoperative care. Understanding this relationship enables nurses to develop patient-centered care plans that promote mental and emotional well-being, which is essential for the long-term success of transplantation outcomes.

This collaboration is important considering the contribution of the attainment of healthy lifestyle behaviors such as adequate and balanced nutrition, exercise, and stress management to the recovery process of postoperative patients. Sociodemographic variables should be taken into consideration to prepare an individualized care plan. Recognizing the sociodemographic characteristics of the patients and developing collaborative care interventions may offer the opportunity to intervene in mediating variables for HLA and PWB. A comparative (longitudinal) prospective evaluation of sociodemographic variables can be recommended so that the results of this study can be utilized to develop a care protocol.

The results of this study show that to be psychologically well, the individual must have awareness of healthy living after transplantation, and this seems to constitute a cycle of variables that reinforce each other. For this reason, it is important that the training programs that surgical nurses organize in the clinic and explain with their counseling roles that provide HLA are sustainable. Psychiatric nurses should recognize the characteristics of the individual together with the surgical nurse when the patient is admitted to the clinic for transplantation, and in collaboration with the surgical nurse, they should create unique programs with motivational content that are sustainable and can improve PWB. The interventions of these two main nursing disciplines should be provided with a protocol that not only covers universal parameters but also accounts for cultural characteristics.

6 | Conclusions

This study provides evidence of the impact of sociodemographic variables on PWB through the mediation of HLA in liver transplant patients. It was demonstrated that the HLA levels of the participants were positively related to and predictive of their PWB levels. It was observed that transplant patients with higher levels of education, job, and income satisfaction could have higher HLA levels. Moreover, age and gender also played an important role in HLA. Older, unemployed, or low-income transplant patients should be supported, especially by nurses, in terms of accessing and understanding information, monitoring complications, adapting to treatment, exercising, and integrating health behaviors such as healthy nutrition into daily life. In addition to gender-based norms of society, women's responsibilities within the family, as well as their social and financial support needs, should also be taken into consideration. It is anticipated that HLA gained by patients throughout the process will indirectly increase PWB and resilience, thus contributing to the achievement of positive liver transplant outcomes. The findings of this study may provide valuable information for healthcare providers to tailor interventions that also support mental and emotional health, which is critical to the long-term success of transplant outcomes.

Author Contributions

Sevinç Meşe: conceptualization, methodology, writing – original draft, data curation, writing – review and editing, formal analysis. **Pınar Harmancı:** conceptualization, methodology, writing – original draft.

Ethics Statement

For conducting the study, an ethical approval was obtained from the Scientific Research and Publication Ethics Committee of Kahramanmaraş Istiklal University, with decision number E-23430505-050.01.04-20479, dated 31.08.2023; and, an institutional permission was obtained from the facility where the research was conducted. The study adhered to the principles of the Helsinki Declaration throughout the research process. Participants were informed that they could withdraw from the study at any stage. It was emphasized to participants that the research results would be published for scientific purposes without any identifying information.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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