



# Investigation of life satisfaction and spiritual well-being of living liver donors in Turkey

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## Abstract

Spiritual well-being may be among the most common feelings felt by living liver donors. The feeling that pushes an individual to good behavior may be spiritual well-being, and the feeling that emerges as a result of achieving goodness may be life satisfaction. In our study, we aimed to analyze the spiritual well-being and life satisfaction of living liver donors and to examine the relationship, if any, between spiritual well-being and life satisfaction. Our descriptive and cross-sectional study was conducted with 306 living liver donors ( $n=306$ ). In the data collection process, we used a personal information form, the Spiritual Well-Being Scale, and the Satisfaction with Life Scale. In data analysis, we utilized descriptive statistical methods, one-way analysis of variance. Of all living liver donors participating in this study, 37.3% were aged 41–50 years, 73.5% were female, and 53.9% donated their liver to their spouse or child. The predictor variable of spiritual well-being was found to account for approximately 29% of the total variance in the predicted variable of life satisfaction. There was a positive and strong correlation between spiritual well-being and life satisfaction of living liver donors ( $p<0.05$ ). Spiritual well-being and life satisfaction of living liver donors are positively affected by each other. In order to provide more psychosocial support to these heroes who disregard their own health and try to save others' lives, it is best practice to support their spiritual well-being, increase their life satisfaction and develop awareness about these two values. No Level Assigned. This journal requires that authors assign a level of evidence to each submission to which Evidence-Based Medicine rankings are applicable. This excludes Review Articles, Book Reviews, and manuscripts that concern Basic Science, Animal Studies, Cadaver Studies, and Experimental Studies. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors [www.springer.com/0026](http://www.springer.com/0026).

**Keywords** Liver transplant · Living liver donors · Satisfaction with life · Spiritual Well-Being

## Introduction

Witnessing that a loved one is facing a high risk of death due to terminal organ failure is a devastating and overwhelming experience. Every individual seeing that a loved one suffers can feel a responsibility for the alleviation of their loved one's pain. By creating internal and external pressure, this situation can push individuals to become living organ donors (Gordon et al., 2011). In the relevant literature, it was reported that 40% of living liver donors developed certain complications in the post-transplantation period, and the donor mortality rate was 0.4% (Abecassis et al., 2012; Ghobrial et al., 2008). In the pre-transplantation period, most of the time, living liver donors are informed about risks in detail and are required to sign and submit an informed consent form. Even if living donor candidates know the risks of liver transplantation, they prefer to

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volunteer to become living donors. A person's relationships with their family members can usually lead them to donate an organ (Chen et al., 2013). The aspiration to save a person's life, the embracement of this aspiration as an ethical duty, and spirituality affect an individual's personal attitudes and values and can motivate them toward donating an organ (Darvishi et al., 2020; Papachristou et al., 2004; Ryu et al., 2019; Walter et al., 2004).

Spirituality is defined as the effort of the individual to explore and embrace their inner world, their relationships with people around them, their individual place in the universe, and the meaning of life (Lalani, 2020). The concept of spirituality has existential and religious dimensions, and concepts such as hope, self-confidence, inner peace, and the meaning of life appertain to its existential dimension whilst relationships with God, who is believed to be divine and eternal, represent its religious dimension (Al Zaben et al., 2015; Borges et al., 2016; Jazieh et al., 2012; Şahin & Bülbüloğlu, 2022). Spiritual well-being is a crucial concept that guides the decisions of individuals. A person's spiritual well-being is a significant factor in terms of establishing a balance between the person and their relationships with the environment. Spiritual well-being boosts life satisfaction and energy in individuals (Asadzandi, 2020; Hall & Powell, 2021; Zeighami & Tajvidi, 2011). Life satisfaction covers a person's subjective well-being and their cognitive judgments about their life. Life satisfaction is defined as individuals' general evaluation of the quality of their life according to a set of criteria selected by themselves (Jowsey et al., 2014; Messersmith et al., 2014). There may be a positive relationship between spiritual well-being and life satisfaction. In this respect, living liver donors are likely to have satisfaction originating from both aspects of this concept.

Living liver donors are individuals who fight to save someone else's life by jeopardizing their own health. Most of the time, in the pre-transplantation period, living liver donors are told that every liver transplant will not result in the recipient's recovery, the recipient can die, and the transplant can go to waste. Likewise, it is possible for living liver donors to die, and they may confront significant complications and adverse effects in the post-transplantation period. Spiritual well-being may be guiding for the decisions of individuals who agree to become living liver donors despite knowing all these risks. These individuals may start having high levels of satisfaction with life after becoming living liver donors. Spiritual well-being of liver donor and candidates has been partially investigated in several studies before (Kayaoğlu & Kavak, 2023; Tas et al., 2022; Weng et al., 2012), but no studies have been found that have linked it to life satisfaction. In our study, we aimed to analyze the spiritual well-being and life satisfaction levels of living liver donors.

## Materials and methods

### Assumptions of the study

Based on the assumption that there is a positive relationship between spiritual well-being and life satisfaction of living liver donors, individuals with high spiritual well-being may become donors and as a result, their life satisfaction may increase. In other words, individuals may experience an increase in their level of spiritual well-being after becoming a liver donor, which may increase their life satisfaction. These two assumptions form the basis of our study.

### Study purpose, design and participants

The aim of this study was to define the spiritual well-being and life satisfaction of an individual who became a liver donor recipient and to examine the relationship between these two values. The data were collected prospectively at the institute of liver transplant in a research and training hospital in eastern Turkey. Living liver donors were selected for the sample of this study with the purposive sampling method. G\*Power-3.1.9.2 was used in the calculation of the sample size required to conduct the study. According to the power analysis (margin of error: 0.05, confidence interval: 95%), a minimum of 158 participants were needed to be included in the sample ( $n=158$ ). On the other hand, a total of 306 participants were included in the sample ( $n=306$ ). Living donors of patients who underwent liver transplantation were called by telephone and invited to the hospital. The data were collected from the participating donors with the survey method after they signed and delivered an informed consent form. The data collection process took place in July 2022. The inclusion and exclusion criteria for this study are demonstrated below.

### Inclusion and exclusion criteria

The inclusion criteria for the study as follows, (i) Being a living liver donor who have already taken part in liver transplantation, (ii) Being interested in participating in the study, (iii) Being aged above 18 years and having no communication or language barrier, (iv) Having donated one's liver at least one month before the study. The exclusion criteria for the study as follows, (i) Being a donor of an organ other than the liver or still being a liver donor candidate, (ii) Being aged below 18 years and not volunteering to participate in the study, (iii) Having a communication or language barrier, (iv) Having donated one's liver in less than one month before the study. Individuals who met the inclusion criteria were included in the sample.

## Data collection and tools

The personal information form, the Spiritual Well-Being Scale, and the Satisfaction with Life Scale were used in the data collection process. Information about the data collection tools is presented below:

### The personal information form

This form included questions designed to collect information on the personal characteristics of the participants in the post-transplantation period, such as gender, age, education level, economic status, and marital status.

### The spiritual well-being scale

The Spiritual Well-Being Scale (SWBS) that was used in our study was originally developed by Daaleman and Frey (2004). Ekşi and Kardaş (2017) adapted the scale to Turkish. SWBS, which was developed for adults, comprises 29 items and is a five-point Likert-type scale (1=Not applicable to me at all, 5=Completely applicable to me). Scores to be obtained from SWBS range from 29 to 145. Higher SWBS scores indicate higher levels of spiritual well-being. SWBS has three subscales, namely Harmony with Nature, Transcendence, and Anomie. In the calculation of the total SWBS score, items of the subscale of Anomie are inversely scored. The Cronbach's alpha coefficient of SWBS was reported as 0.88. In our study, this coefficient was calculated as 0.89.

### The satisfaction with life scale

Diener et al. developed SWLS (Diener et al., 1985). SWLS has five items and is a five-point Likert-type scale. Higher SWLS scores refer to higher levels of satisfaction with life. Dağlı and Baysal (2016) adapted SWLS to Turkish. In the study performed to adapt SWLS to Turkish, the Cronbach's alpha coefficient of the scale was found as 0.88. In this study, this coefficient was calculated as 0.84.

### Statistical analysis

In our study, we used the Statistical Package for the Social Sciences (SPSS) 25.0 to analyze the data. Before the data analysis, by using the Kolmogorov-Smirnov test, we examined whether our data were normally distributed. In the analysis, we utilized descriptive statistical methods (frequency, percentage, arithmetic mean, and standard deviation), one-way analysis of variance (Anova), and paired-samples t-test. We also used a Scheffe posthoc tests to identify the source of significant differences that were found in the main analyses.

We used simple linear regression analysis and Pearson correlation analysis for the examination of the relationships between the scale scores of the participants. We evaluated the analysis results in a confidence interval of 95% and at a statistical significance level of 0.05 ( $p < 0.05$ ).

### Ethical considerations

Our study was approved by the Institutional Review Board of the Liver Transplant Institute affiliated with Turgut Ozal Medical Center of Inonu University in Malatya, Turkey. Next, we obtained ethical approval for our study from the Ethics Committee of the Faculty of Medicine at Inonu University (Decision No: 2022/3630, Session No: 12, Date: 21 June 2022). Living liver donors were included in the study only after they signed and submitted an informed consent form upon being informed about the research protocol in compliance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all individual participants included in this study.

## Results

Table 1 displays the personal characteristics and mean SWBS and SWLS scores of the participants. Of all participants, 37.3% were aged 41–50 years, 73.5% were female, 72.5% were married, 43.1% had higher education degrees, 62.7% had a medium-level income, 53.9% donated their livers to their spouses or children, 93.1% wanted to donate no organ after death. It was found that the participants who were aged 28–40 years had the lowest mean SWBS score and the highest mean SWLS score. Furthermore, it was discerned that the female participants had a significantly higher mean SWBS score than the male participants, those who had high school or higher education degrees had significantly higher mean SWBS scores than those who had primary school degrees ( $p < 0.05$ ). Furthermore, the female participants had a significantly higher mean SWLS score than the male participants, and the single participants had a significantly higher mean SWLS score than the married donors. Moreover, as the participants with higher education and income levels had higher life satisfaction levels ( $p < 0.05$ ) (Table 1).

Table 2 presents the mean SWBS and SWLS scores of the participants. The mean SWLS and SWBS scores of the participants were successively  $18.24 \pm 1.97$  (min: 15, max: 23) and  $105.55 \pm 6.27$  (min: 88, max: 145). The mean scores of the participants in the SWBS subscales of Transcendence, Harmony with Nature, and Anomie were found consecutively as  $54.38 \pm 3.93$ ,  $25.76 \pm 2.49$ , and  $25.41 \pm 2.79$ .

**Table 1** Living liver donors' participant demographic characteristics and mean SWBS and SWLS scores ( $n=306$ )

| Characteristics                                 | <i>n</i> | %    | SWBS<br>$\bar{x}\pm Sd$ | SWLS<br>$\bar{x}\pm Sd$ |
|-------------------------------------------------|----------|------|-------------------------|-------------------------|
| <b>Age</b>                                      |          |      |                         |                         |
| 28–40 years (1)                                 | 147      | 48   | 104.34±6.54             | 18.47±1.95              |
| 41–50 years (2)                                 | 114      | 37.3 | 106.78±5.98             | 18±1.92                 |
| 51 years or above (3)                           | 45       | 14.7 | 106.4±5.38              | 18.13±2.11              |
| <i>F</i>                                        |          |      | 3.502                   | 4.141                   |
| <i>p</i>                                        |          |      | <b>0.000**</b>          | <b>0.000**</b>          |
| Post Hoc                                        |          |      | 2,3>1                   | 1>2,3                   |
| <b>Gender</b>                                   |          |      |                         |                         |
| Female                                          | 225      | 73.5 | 105.89±6.37             | 18.42±1.9               |
| Male                                            | 81       | 26.5 | 104.62±5.9              | 17.74±2.09              |
| <i>t</i>                                        |          |      | 2.710                   | 2.725                   |
| <i>p</i>                                        |          |      | <b>0.000**</b>          | <b>0.009**</b>          |
| <b>Marital status</b>                           |          |      |                         |                         |
| Married                                         | 222      | 72.5 | 105.71±6.32             | 18.22±1.96              |
| Single                                          | 84       | 27.5 | 105.14±6.15             | 18.28±2                 |
| <i>t</i>                                        |          |      | 4.073                   | 2.599                   |
| <i>p</i>                                        |          |      | 0.414                   | <b>0.013*</b>           |
| <b>Education level</b>                          |          |      |                         |                         |
| Primary school (1)                              | 57       | 18.6 | 102.31±6.88             | 17.36±1.91              |
| High school (2)                                 | 117      | 38.2 | 107.69±5.52             | 18.20±2.03              |
| School of higher education (3)                  | 132      | 43.1 | 105.06±5.95             | 18.65±1.82              |
| <i>F</i>                                        |          |      | 3.849                   | 6.012                   |
| <i>p</i>                                        |          |      | <b>0.000**</b>          | <b>0.000**</b>          |
| Post Hoc                                        |          |      | 2,3>1                   | 3>2>1                   |
| <b>Economic status</b>                          |          |      |                         |                         |
| Low (1)                                         | 72       | 23.5 | 105.16±5.58             | 17.87±1.91              |
| Medium (2)                                      | 192      | 62.7 | 105.37±6.47             | 18.29±1.92              |
| High (3)                                        | 42       | 13.7 | 105.07±6.39             | 18.64±2.25              |
| <i>F</i>                                        |          |      | 3.163                   | 6.591                   |
| <i>p</i>                                        |          |      | 0.243                   | <b>0.000**</b>          |
| Post Hoc                                        |          |      |                         | 3>1,2                   |
| <b>Relation to the recipient</b>                |          |      |                         |                         |
| Spouse or child (1)                             | 165      | 53.9 | 107.05±6.69             | 18.36±2.08              |
| Sibling or parent (2)                           | 105      | 34.3 | 104.48±5.18             | 18.14±1.87              |
| Distant relatives (3)                           | 36       | 11.8 | 101.83±4.98             | 18±1.70                 |
| <i>F</i>                                        |          |      | 3.918                   | 1.204                   |
| <i>p</i>                                        |          |      | <b>0.000**</b>          | 0.314                   |
| Post Hoc                                        |          |      | 1,2>3                   |                         |
| <b>Status of donating any organ after death</b> |          |      |                         |                         |
| Yes, already donated                            | 21       | 6.9  | 104±6.02                | 18.57±1.2               |
| No, did not want to donate                      | 285      | 93.1 | 105.67±6.28             | 18.22±2.02              |
| <i>t</i>                                        |          |      | 4.903                   | 3.078                   |
| <i>p</i>                                        |          |      | <b>0.000**</b>          | <b>0.004**</b>          |

*F*One-way analysis of variance (ANOVA), *t*Paired samples *t*-test, \*\* $p<0.01$ , \* $p<0.05$

**Table 2** Means of living liver donors' SWBS and SWLS scores ( $n=306$ )

| Scales and sub-scales | Number of questions | Items                                                     | Score range | Min.-Max. | $\bar{x}\pm Sd$ |
|-----------------------|---------------------|-----------------------------------------------------------|-------------|-----------|-----------------|
| SWLS                  | 5                   | 1,2,3,4, and 5                                            | 5–25        | 15–23     | 18.24±1.97      |
| SWBS                  | 29                  | 1–29                                                      | 29–145      | 88–123    | 105.55±6.27     |
| Transcendence         | 15                  | 1, 4, 5, 8, 9, 12, 13, 16, 17, 20, 21, 24, 25, 27, and 29 | 15–75       | 43–62     | 54.38±3.93      |
| Harmony With Nature   | 7                   | 2, 6, 10, 14, 18, 22, and 28                              | 7–35        | 21–31     | 25.76±2.49      |
| Anomie                | 7                   | 3, 7, 11, 15, 19, 23, and 26                              | 7–35        | 19–32     | 25.41±2.79      |

Table 3 exhibits the results of the regression analysis of the SWBS and SWLS scores of the participants. According to these results, the predictor variable of spiritual well-being accounted for approximately 29% of the total variance in the predicted variable of life satisfaction ( $R^2=0.29$ ,  $p=0.005$ ).

Figure 1 shows the relationship between the spiritual well-being and life satisfaction levels of the participants. In this regard, high life satisfaction levels became more prevalent among the participants after an SWBS score of 90.

Table 4 shows the correlation analysis between SWBS and SWLS, and also between the sub-dimensions of SWBS and SWLS. There was a positive, strong and statistically significant relationship between life satisfaction and spiritual well-being of living liver donors ( $p=0.001$ ). There was a positive, moderate and statistically significant relationship between life satisfaction and Transcendence ( $p=0.015$ ). There was a positive, strong and statistically significant relationship between life satisfaction and Harmony with Nature ( $p=0.000$ ).

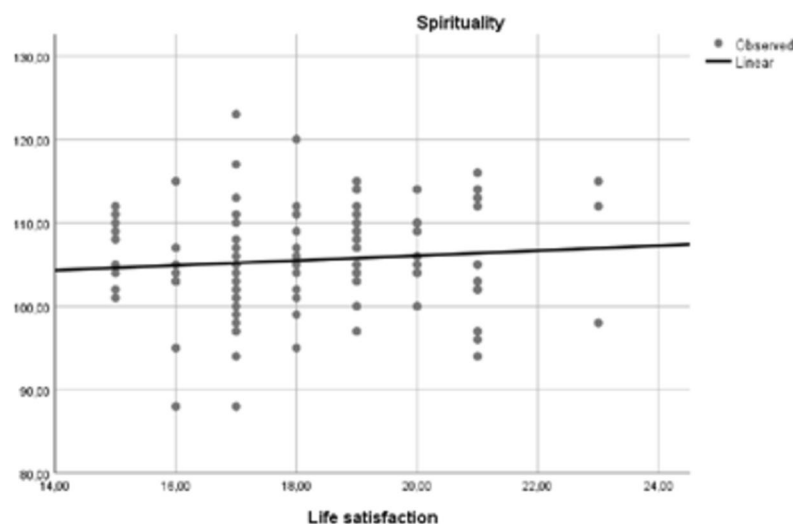
## Discussion

The results of this study showed that spiritual well-being and life satisfaction were partially affected by several individual characteristics. Individuals aged 40 and over, women, people with low education levels, and people who were donors for their children or spouses had higher spiritual well-being. Women, singles, and donors with higher economic status had higher life satisfaction. The scores of the

**Table 3** Regression analysis of living liver donors' SWBS and SWLS scores ( $n=306$ )

| Model Summary and Parameter Estimates    |               |       |     |     |                |                     |       |
|------------------------------------------|---------------|-------|-----|-----|----------------|---------------------|-------|
| Predicted Variable: Spiritual Well-Being |               |       |     |     |                |                     |       |
| Equation                                 | Model Summary |       |     |     |                | Parameter Estimates |       |
|                                          | R-Squared     | F     | df1 | df2 | Sig.           | Constant            | b1    |
| Linear                                   | 0.29          | 2.645 | 1   | 306 | <b>0.005**</b> | 100.179             | 0.295 |

The predictor variable is Life Satisfaction.

**Fig. 1** The relationship between spiritual well-being and life satisfaction**Table 4** Correlation analysis of living liver donors' SWBS and SWLS scores ( $n=306$ )

| Scales and sub-scales | SWLS     |                |
|-----------------------|----------|----------------|
|                       | <i>r</i> | <i>p</i>       |
| SWBS                  | 0.093    | <b>0.001**</b> |
| Transcendence         | 0.490    | <b>0.015*</b>  |
| Harmony With Nature   | 0.194    | <b>0.000**</b> |
| Anomie                | 0.320    | 0.520          |

*r* Pearson Correlation; \* $p < 0.05$ , \*\* $p < 0.01$

above-mentioned categories were statistically significant but not extremely high numerically. In a previous study, donors who were older adults, male, or single had lower levels of life satisfaction than other corresponding groups (Mathur et al., 2020). It may be that maturation due to increasing age causes individuals to turn inward and increase their spiritual well-being. The fact that women are more emotionally centered than men may have paved the way for them to experience greater spiritual well-being. Similarly, higher economic status may have increased the life satisfaction of living liver donors because it creates more freedom.

In our study, the mean spiritual well-being score of the participants was  $105.55 \pm 6.27$ , and all participants were living liver donors. In our study, the mean SWLS scores of the participants was  $18.24 \pm 1.97$ . A study that analyzed the effects of spiritual well-being on attitudes toward organ donation in Turkey reported the mean spiritual well-being scores of the participants as  $125.02 \pm 13.88$ , but only 8.7% of the participants donated their organs (Taş et al., 2022).

Samples of studies that examined the effects of spiritual well-being on attitudes toward organ donation mostly comprised individuals with no experience in organ donation as donors (Alcan & Gül, 2021; Taş et al., 2022; Bolgeo et al., 2021). On the other hand, our study was conducted with the participation of individuals who had first-hand experience as donors. Therefore, the findings of our study are a crucial source of information and unique.

In this study, 93.1% of donors did not donate organs again. Highlighting the fact that the donor experience is quite challenging. The donor has an as significant place as the recipient in liver transplantation. After all, the presence of a healthy donor has a key role in successful liver transplantation. Becoming a liver donor can be easier than becoming a kidney donor because after the transplantation, the liver donor's liver regeneration process is almost completed in a short period such as a year (Olthoff et al., 2015). However, this situation is not possible in the case for kidney, uterus, and lung donors (Ong et al., 2021). Even if the ability of the liver to regenerate itself is a factor that is likely to encourage an individual to become a donor, the development of a variety of complications and the obligation to cope with the care burden in the post-transplantation period necessitate the donor to have a challenging experience.

In this study, there was a strong positive correlation between spiritual well-being and life satisfaction in living liver donors. A similar correlation was also found between harmony with nature and life satisfaction. Spiritual

well-being and life satisfaction were previously brought to the agenda by Procházka and Bočková (2024). According to them, the work performance of healthy early career project managers is guided by these emotional values. As a result of the mentioned study, a positive and moderately strong correlation was found between the spiritual well-being and life satisfaction of early career project managers (Procházka & Bočková, 2024). Yang et al., in 2024, examined the subjective well-being and social cohesion of residents. The social cohesion measure predicts adopting calmness and harmony, such as harmony with nature. The same study reported that perception of benefit, emotional solidarity and creating shared value increase subjective well-being (Yang et al., 2024). Studies in the literature reveal the universal nature of positive emotions such as spiritual well-being and life satisfaction. These feelings are values that not only living liver recipients but also healthy people need and should not be allowed to atrophy.

Another result we obtained in this study is that the spiritual well-being of living liver donors explains 29% of their life satisfaction. The relevant literature emphasizes that the psychiatric state of liver donors does not deteriorate, and the quality of their life increases (Parikh et al., 2010). In a study performed with the participation of living liver donors, it was reported that 96% of the donors had high levels of life satisfaction during the organ donation process and in the post-donation period. In the same study, none of the participants regretted their decision to donate their livers, and 98% of them said they would donate again (Azoulay et al., 2011). Other studies in the relevant literature have shown that the rate of organ donors who are satisfied with their lives is above 80% (Oguten et al., 2019; Taskintuna et al., 2009). Donating a piece of the liver to a liver failure patient on her deathbed, thus helping the patient hold on to life and stay alive, may have increased the donor's inner peace and life satisfaction. In this regard, a high level of spiritual well-being can guide donor candidates. An ideal approach would be to start spiritual counseling by experts for living liver donors while they are still donor candidates and continue it in the following years.

## Limitations

This study has several principle limitations. The limitations of our study were the design of our research as a single-center study and the analysis of life satisfaction without the evaluation of problems experienced by the participants in the post-transplantation period. Our study was of descriptive type and we did not have a control group, so we could not make a comparison. Spiritual well-being and life satisfaction scores that vary according to sociodemographic characteristics may weaken the power of correlation and

regression tests. As their spirituality levels rise, the life satisfaction of donors may also increase, and longitudinal studies are required for examining this relationship in long-term. Another limitation of this study was the measurement of outcomes that were self-reported by liver donors. The spiritual well-being of a liver donor may not be a stand-alone measure of their life satisfaction. Similarly, we could not determine whether liver donors' assessments of their own spirituality and life satisfaction were sufficient in terms of objectivity.

## Conclusion

In end-stage liver failure, organ transplantation is the only life-saving option, but due to donor shortage, the life of potential recipients may end. Living liver donors have important duties in eliminating the donor shortage. However, during this process, encouraging potential donors and providing psychosocial support to donors are very important. Living liver donors can have difficulty coping with the post-transplantation care burden. Spiritual well-being affects life satisfaction in living liver donors. The enhancement of their spiritual well-being will strengthen their coping mechanisms, and hence, their satisfaction with life will increase. As a matter of fact, in our study, it was found that spiritual well-being was a significant predictor of life satisfaction, and they were in the same direction of relationship. Understanding living liver donors in terms of spirituality and life satisfaction during the pre-transplantation process, defining their circumstances, and supporting them in terms of these two aspects in the post-transplantation period will enable them to have a better post-transplantation experience. We recommend that other variables affecting life satisfaction (e.g., psychological health, social support) be investigated in future studies. According to a report published by the Pew Research Center, more than 90% of the population in Turkey has a religion they believe in and define themselves as people with spiritual well-being (Religion in Turkey, 2025). From this perspective, the Turkish people's perspective on initiatives that increase their spiritual well-being is quite mild. We believe that they will volunteer to receive spiritual counseling.

**Author contributions** HG: Conceptualization, Data curation, Formal analysis, Funding acquisition, Software, Validation, Writing– original draft, Writing– review & editing.

SB: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing– original draft, Writing– review & editing.

SS: Conceptualization, Data curation, Formal analysis, Funding acquisition, Software, Validation, Writing– original draft, Writing– review & editing.

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**Data availability** The detail about original data can be requested from the corresponding author.

## Declarations

**Ethical considerations** Our study was approved by the Institutional Review Board of the Liver Transplant Institute affiliated with Turgut Ozal Medical Center of Inonu University in Turkey. Next, we obtained ethical approval for our study from the Ethics Committee of the Faculty of Medicine at Inonu University (Decision No: 2022/3630, Session No: 12, Date: 21 June 2022). Living liver donors were included in the study only after they signed and submitted an informed consent form upon being informed about the research protocol in compliance with the principles of the Declaration of Helsinki.

**Informed consent** Written informed consent was obtained from all individual participants included in this study.

**Conflict of interest** The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. There is no conflict of interest about authors or the article. The authors didn't received institutional support, non-commercial grants, commercial support. All of authors meet the authorship criteria. Research data was collected by Guneş and Saritas.

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