

## Health-related quality of life after liver transplantation

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### Abstract

**Background:** Mongolian citizens in need of liver transplant treatment have been receiving the treatment abroad since 2004, and in Mongolia since 2011. As the number of years of life after liver transplantation increases, it is important to better understand the factors that influence patient's quality of life during those years, and what can be done to modify them. <sup>(1)</sup> Quality of life reflects how the interaction between socio-economic and environmental factors influences social and human development. <sup>(2)</sup> Studies on work capacity have shown that 6% of people after liver transplantation are classified as unable to work based on functional and international disability assessments, <sup>(3)</sup> while 23-61% are fully employed after liver transplantation. <sup>(4)(5)</sup> There is a lack of research examining the physical, psychological, and social well-being of patients after liver transplant treatment in Mongolia.

**Methods:** Data were collected from 144 liver transplant cases using descriptive research design and questionnaire method. The study used the SF-36 Health Assessment Questionnaire, which was grouped into 8 groups and the scores were averaged according to the scale. The results of the study were analyzed using SPSS 25.0 software using Pearson's Chi-square test for differences between groups.

**Results:** Of the total 144 cases included in the study, 81 (56.3%), were male and 63 (43.8%) were female. By age group, 120 (83.3%) are between the ages of 19-60, or working age, and 24 (16.7%) are over 60. Employment after liver transplantation was 41 (28.5%) full-time, 19 (13.2%) part-time, 84 (58.3%) unemployed or there was no statistically significant difference between groups ( $P=0.024$ ), of which 62 (43%) were willing to work, 17 (12%) were unwilling to work, and 65 (45%) were unknown (0.173) with no statistically significant difference. When assessing health-related quality of life, physical activity was  $65.7\pm 27.1$ , health-related limitations  $38.5\pm 40.1$ , psychological limitations  $41.9\pm 43.0$ , pain  $65.5\pm 27.2$ , psychological average  $71.7\pm 19.2$ , physical energy average  $57.8\pm 21.2$ , moderate, social participation average  $68.1\pm 20.6$ , and health change  $85\pm 22.2$ , indicating that citizens who underwent liver transplant treatment had good health-related quality of life and health change indicators.

**Conclusion:** People who have undergone liver transplant treatment have good health-related quality of life and health-related changes.

**Keywords:** Liver transplant; Health; Quality of life; SF-36

### 1. Introduction

Mongolia first began performing liver transplants in 2011, the country is economically limited, but over the past 10 years, cell, tissue, and organ transplants have been developed in the healthcare sector, and this treatment has been

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provided in developed countries around the world. <sup>(6)</sup> One measure of this that, on average, over 90% of people worldwide survive for 1 year and over 75% survive for 5 years for 5 years after liver transplantation. <sup>(7)</sup> In Mongolia, the 1year survival rate after liver transplantation is 93.7%, the 3 year survival rate is 92.3%, and the 5 year survival rate is 91.2%. <sup>(8)</sup> The World Health Organization defines health as “a state of complete physical, mental, and social well-being”.<sup>(9)</sup> The research outlook for organ transplant therapy is focused on long-term survival and health-related quality of life (HrQoL).<sup>(10)</sup> Quality of life assessments have shown that although quality of life after liver transplantation is higher than before, physical function is lower than in the healthy population.<sup>(4)</sup> The frail phenotype in patient with cirrhosis is thought to be primarily due to malnutrition, muscle weakness, and neuromotor dysregulation.<sup>(11)(12)</sup> The above factors are considered in the 3 tests of the Liver Weakness Phenotypic Index. These include physical function assessments such as grip strength, balance, and muscle function <sup>(13)</sup>, and the Frailty Phenotype Index (LFI) is defined as one of three groups of physical function assessments in the SF36 test. There is no study in Mongolia that examines the physical, psychological, and social well-being of patient after liver transplant treatment.

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## 2. Material and methods

### 2.1. Study design

Data were collected using a descriptive research design and questionnaire method.

### 2.2. Study population

The sample size of clients required for the study was calculated using the formula of Krejcie and Morgan <sup>(14)</sup> when the original population size is known. The required sample size was estimated to be 144 patients, which was distributed proportionally according to whether they received liver transplant treatment at the National Institute of Health and abroad, resulting in a sample size of 69 patients treated at the National Institute of Health and 75 patients treated abroad.

Eligibility criteria for the survey - Citizens who have undergone liver transplant treatment at the First State Hospital and abroad, included in the target sample.

Exclusion criteria -Refusal to participate in the study

### 2.3. Variables

The survey questionnaire, the SF-36 Health Assessment Questionnaire, was grouped as follows. We converted the scores for these groups of questions into a score from 0 to 100 and averaged the scores according to the eight groups above.

- Physical activity
- Physical pain
- Physical activity limitations
- Psychological activity limitations
- Personal psychological state
- Social participation
- General health status
- Health changes

### 2.4. Statistical analysis

The SF-36 (Short Form Survey) questionnaire, developed by the American Rand Corporation, was used to assess quality of life, and consisted of eight categories: physical health, psychological health, level of independence, social relationships, environment, personal values, and beliefs. The assessment was calculated in two stages. First, each question was converted to a score from 0 to 100, with higher scores indicating better health. Second, the scores were averaged across eight groups according to the scale.

The results of the study were analyzed using SPSS25. Pearson’s Chi-square test was used to calculate the mean, standard deviation, and mean difference between groups for life assessment after liver transplantation.

### 3. Results

Of the 144 cases included in the study, 69 (47.9%) received liver transplant treatment in Mongolia and 75 (52.1%) abroad, and 81 (56.2%) were male and 63 (43.8%) were female. By age group, 0 (0%) were 0-9 years old, 1 (0.7%) were 20-29 years old, 15 (10.4%) were 30-39 years old, 47 (32.6%) were 40-49 years old, 50-59 years old, and 24 (16.7%) were over 60 years old. By educational level, 3(2.1%) had primary education, 39(27.1%) had secondary education, and 102 (70.8%) had tertiary education. In terms of employment, 24 (16.7%) workers, 16 (11.1%) employees, 59 (41.0%) in the group, and 35 (24.3%) pensioners (P=0.002) showed a statistically significant difference. (Table 1)

**Table 1** Demographic characteristics of study participants

Indicator	Sum		Country where liver transplant treatment was performed						P value
			Mongolia			Foreign country			
	N	%	Number	Percentage (along the line)	Percentage (By column)	Number	Percentage (along the line)	Percentage (By column)	
Gender									0.69
Male	81	56.2	40	49.4	58	41	50.6	54.7	
Female	63	43.8	29	46	42	34	54	45.3	
Age group									
0-9	0	0	0	0	0	0	0	0	
10-19	1	0.7	1	100	1.5	0	0	0	
20-29	1	0.7	1	100	1.5	0	0	0	
30-39	15	10.4	8	53.3	11.5	7	46.7	9.3	
40 - 49	47	32.6	24	51.1	34.8	23	48.9	30.7	
50 - 59	56	38.9	30	53.6	43.5	26	46.4	34.7	
Over 60+	24	16.7	5	20.8	7.2	19	79.2	25.3	
Education level									0.768
Low	3	2.1	2	66	2.8	1	50	1.3	
Medium	39	27.1	18	46.2	26.1	21	53.8	28	
High	102	70.8	49	48	71	53	52	70.7	
Employment									0.002
Employee	24	16.7	7	29.2	10.1	17	70.8	22.7	
Officer	16	11.1	8	50	11.6	8	50	10.7	
Pension	35	24.3	10	28.6	14.5	25	71.4	33.3	
Disability	59	41	39	66.1	56.5	20	33.9	26.7	
Other	10	6.9	5	50	7.2	5	50	6.7	
	144	100	69	47.9	100	75	52.1	100	

When viewed in relation to physical health, psychological state, level of independence, social relationships, personal beliefs, and environmental characteristics, there were no differences in general health and health change indicators among people who underwent liver transplants treatment. Physical activity Mongolian  $65.3 \pm 26.9$ , foreign  $65.9 \pm 27.3$  ( $P=0.900$ ), health-related limitations Mongolia  $35.1 \pm 37.7$ , foreign  $41.6 \pm 42.1$  ( $P=0.329$ ), psychological limitations Mongolian  $40.1 \pm 43.3$ , foreign  $43.5 \pm 42.7$  ( $P=0.631$ ), physical energy Mongolian  $59.4 \pm 22.2$ , foreign  $56.3 \pm 20.3$  ( $P=0.386$ ), psychological Mongolian  $72.2 \pm 18.7$ , foreign  $71.2 \pm 19.6$  ( $P=0.761$ ), social participation Mongolian  $69.2 \pm 20.0$ , foreign  $67.1 \pm 21.2$  ( $P=0.556$ ), pain Mongolian  $63.7 \pm 26.7$ , foreign  $67.2 \pm 27.7$  ( $P=0.438$ ), general health Mongolian  $52.9 \pm 13.0$ , foreign  $49.2 \pm 16.0$  ( $P=0.133$ ), health change Mongolian  $88.4 \pm 19.4$ , foreign  $82.3 \pm 24.2$  ( $P=0.098$ ) there was no statistically significant difference. (Table 2)

**Table 2** Quality of life assessment

Indicator	Country where liver transplant treatment was performed				P value
	Mongolia		Foreign country		
	Mean	St.D	Mean	St.D	
Physical functioning	65.3	26.9	65.9	27.3	0.900
Role limitations due to physical health	35.1	37.7	41.6	42.1	0.329
Role limitations due to emotional problems	40.1	43.3	43.5	42.7	0.631
Energy fatigue	59.4	22.2	56.3	20.3	0.386
Emotional well being	72.2	18.7	71.2	19.6	0.761
Social functioning	69.2	20.0	67.1	21.2	0.556
Pain	63.7	26.7	67.2	27.7	0.438
General health	52.9	13.0	49.2	16.0	0.133
Health change	88.4	19.4	82.3	24.2	0.098

P value is Independent 2 sample T test

When comparing the health related quality of life by employment after liver transplantation, there were statistically significant differences in physical activity working  $76.42 \pm 22.50$ , not working  $59.40 \pm 27.61$  ( $P < 0.001$ ), health related limitations working  $54.72 \pm 41.04$ , not working  $55.35 \pm 42.84$ , not working  $34.07 \pm 41.27$  ( $P=0.004$ ), pain working  $75.00 \pm 21.61$ , not working  $60.03 \pm 28.69$  ( $P=0.001$ ), and general health working  $54.62 \pm 13.83$ , not working  $48.96 \pm 14.97$  ( $P=0.026$ ).

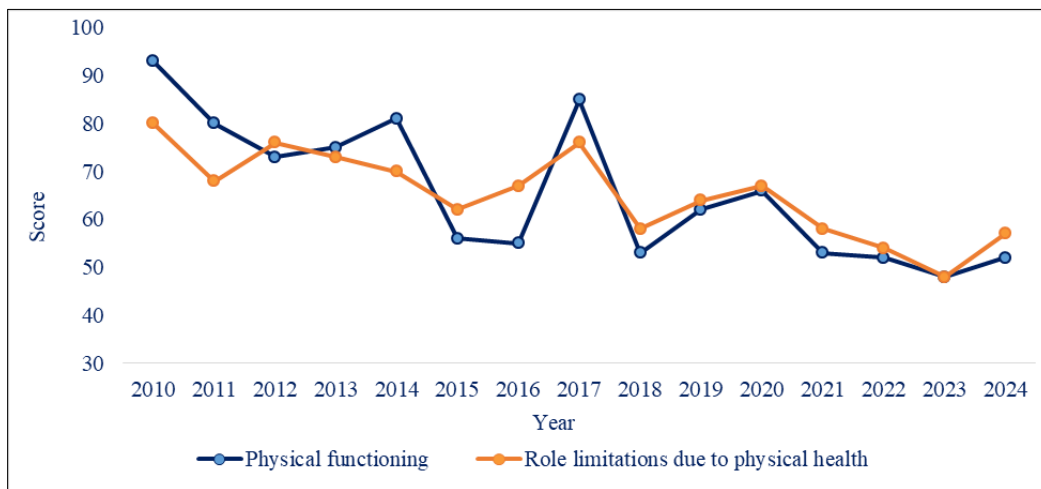
However, there were no statistically significant differences in physical energy when working,  $60.47 \pm 18.53$ , and when not working,  $56.26 \pm 22.63$  ( $P=0.253$ ), psychological energy when working,  $71.70 \pm 16.71$ , and when not working,  $71.74 \pm 20.60$  ( $P=0.991$ ), social participation when working,  $68.40 \pm 16.91$ , and when not working,  $67.99 \pm 22.61$  ( $P=0.904$ ), and health changes when working,  $85.38 \pm 21.05$ , and when not working,  $85.16 \pm 22.97$  ( $P=0.956$ ). The average physical activity scores of the above groups were  $63.52 \pm 25.32$ , when working and  $52.90 \pm 25.75$ , when not working ( $P=0.018$ ), and the psychological scores were  $64.94 \pm 14.53$ , when working and  $53.63 \pm 17.87$  when not working ( $P < 0.001$ ), with statistically significant differences. Health related quality of life is higher in people who are employed after liver transplantation. (Table 3)

**Table 3** Quality of life assessment (By employment)

Indicator	Employment after liver transplant treatment				P value
	Yes		No		
	Mean	St.D	Mean	St.D	
Physical functioning	76.42	22.50	59.40	27.61	<0.001
Role limitations due to physical health	54.72	41.04	29.12	36.56	<0.001
Role limitations due to emotional problems	55.35	42.84	34.07	41.27	0.004
Energy fatigue	60.47	18.53	56.26	22.63	0.253
Emotional well being	71.70	16.71	71.74	20.60	0.991
Social functioning	68.40	16.91	67.99	22.61	0.904
Pain	75.00	21.61	60.03	28.69	0.001
General health	54.62	13.83	48.96	14.97	0.026
Health change	85.38	21.05	85.16	22.97	0.956
Physical functioning	63.52	25.32	52.90	25.75	0.018
Role limitations due to physical health	64.94	14.53	53.63	17.87	<0.001

P value is Independent 2 sample T test

Compared with the overall health related quality of life assessment, general physical functioning indicators and general psychological indicators improved with increasing years after treatment.



**Figure 1** Quality of life liver transplantation (years)

In Figure1, when the above eight indicators are grouped, the overall quality of life indicator of physical activity was the highest in people who received treatment in 2010 ( $93 \pm 7.0$ ),  $80 \pm 0.0$  in 2011,  $75.3 \pm 29.2$  in 2013,  $81.4 \pm 17.3$  in 2014, and  $85 \pm 15.5$  in 2017, while the lowest was  $48.5 \pm 24.7$  in 2023 and  $52.3 \pm 26.8$  in 2022 ( $P=0.046$ ), with a statistically significant difference. When assessing the general indicators related to psychological health, the highest was  $80 \pm 2.9$  in 2010,  $73.3 \pm 2.9$  in 2013,  $70.5 \pm 12.6$  in 2014, and  $76.2 \pm 0.0$  in 2017, and the lowest was  $48.8 \pm 17.5$  in 2023,  $52.6 \pm 11.9$  in 2024, and  $54.0 \pm 15.7$  in 2022 ( $P=0.008$ ), with statistically significant differences.

#### 4. Discussion

Our study found that the health improvement after liver transplantation was 88.4% and the psychological state was 72.2% which is good. A study assessing quality of life using the SF-36 method, conducted by Kristin Pazekas (2024) in

the study “Health related quality of life and work ability of patients after liver transplantation”, found that general health was 69.7%,<sup>(10)</sup> according to a study by Isabel Roldo Noguera (2020) and colleagues, “Quality of life after living donor liver transplantation” general health was 73.2%, and psychological well-being was 66.4%,<sup>(15)</sup> according to study by Hillary Monick (2009) on “Health related quality of life after liver transplantation in adults”, general health was 58%, and psychological well-being was 73%,<sup>(16)</sup> Jennifer S.Lai (2023) “Association of Frailty With Health-Related Quality of Life in Liver Transplant Recipients”,<sup>(1)</sup> Louis Onghena (2016) “Quality of life after liver transplantation: State of the art”,<sup>(17)</sup> Santiago Tome (2008) “Quality of life after liver transplantation. A systematic review”<sup>(18)</sup> as a result, the quality of life after liver transplantation has improved compared to previous periods. In a study by Maria Ann Simpsin (2023) “Health-related Quality of Life After Liver Transplantation—An Important Goal, but One Definition (or Size) Does Not Fit All” health related quality of life after liver transplantation is influenced by drug choice, side effects, treatment waiting time, basic health knowledge, physical condition, and individual characteristics. These factors are thought to play an important role in the overall well-being of liver transplant recipients.<sup>(19)</sup> Nakao et.al (2016) conducted a health survey in 8 hospitals in Ulaanbaatar, Mongolia, in 2012-2013, using the SF36 assessment method to assess the health status of adults in Ulaanbaatar, a city with high air pollution. The results of the study showed that the quality of life questionnaire scores were high, and Cronbach’s alpha was above 0.7 in most subgroups, indicating that the questionnaire was reliable.<sup>(20)</sup> Our study did not compare the quality of life before liver transplantation with that of healthy controls, and this is important to investigate further.

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## 5. Conclusion

Compared with the overall health related quality of life assessment after liver transplantation, general physical function and general psychological indicators improved with increasing years after treatment.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of ethical approval*

The research methodology was discussed and approved by the Academic Council of the School of Public Health, Mongolian National University of Medical Sciences on May 31, 2022 (meeting no. 22/15). This discussion occurred during a meeting of the Research Ethics Review Committee of the Mongolia National University of Medical Sciences on June 22, 2022 (meeting no. 2022/3-07), and permission for conducting the study was granted.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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