



Psychosocial Assessment of Donors in Pediatric Living Donor Liver Transplantation: A Systematic Review

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ABSTRACT

Background. Pediatric living donor liver transplantation (LDLT) is the only way to save children with end-stage liver disease. The donor for liver transplantation (LT) may have a complicated psychosocial condition.

Purpose. This review aims to identify the domains of the donor psychosocial questions that should be addressed and summarize the aspects and tools future psychosocial assessments should include.

Methods. We searched the PubMed, Medline, Cochrane Library, Embase, Web of Science, and Google Scholar databases for the terms pediatric, liver transplantation, donor, and psychosocial. We used the Joanna Briggs Institute Critical Appraisal Tool to appraise reporting quality. Two researchers independently selected the papers and performed data extraction and quality appraisal.

Results. The articles included in this review contain 26 quantitative studies and 2 qualitative studies. The study quality was moderate to high. Donors have ambivalence, anxiety, the need for family and social support, the need for adequate information, distress, and low self-esteem during the preoperative period. In the postoperative period they have poor psychological condition, panic disorder, conversion disorder and substance use/abuse disorder, abnormal family functioning, better psychosocial outcome, or among others. The assessment methods consisted of the questionnaire survey and semi-structured interview. Among the 28 studies, 17 different psychosocial domains were mentioned. The most frequently referred to was family and social support.

Conclusion. The contents of the psychosocial assessment must include anxiety or depression, family and social support, ambivalence, information, and positive psychosocial characteristics. Assessment methods should use the questionnaire survey and semi-structured interview. According to this review, future research can develop a specific psychosocial assessment tool for pediatric LT donors.

LIVER transplantation (LT) is the only way to save children with end-stage liver disease, and because of the lack of liver sources, living donor liver transplantation (LDLT) has become the leading surgical method [1,2]. LDLT has saved the lives of many children. The first

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successful LDLT operation was in the 1980s in Australia [3]. The child's parents usually are the first choice for donating the liver. The parents then have 2 roles: as the donor and as the caregiver. Thus, the donor's psychosocial condition is complicated because of the pressure of the situation. Some donors said the donation creates happiness because donors save their child [4]. For other donors, some researchers reported that the liver donor has mental illness complications after transplantation [5]. Psychosocial assessment can verify psychological stability, discover psychosocial risks, and facilitate positive psychology assistance [6]. During the development of pediatric LDLT, research on the donor also has been increasing. However, most researchers focused on the postoperative quality of life of donors, such as the report by Chandran et al [7]. Some researchers concentrated on anxiety and depression assessment [8], and a few conducted studies on the psychological status of donors [9].

Research methods of psychosocial status assessment generally focus on quantitative and qualitative research. Questionnaire surveys can measure whether the donor has a psychological problem and can assess most aspects of the donor's psychosocial status because of the diversity of questions [10]. The increasing number of studies on donor psychosocial issues [11] reflects the importance of psychosocial assessment. The published British LDLT guidelines indicate that all potential donors must undergo assessment for psychological status [1], and other guidelines as well have emphasized the importance of psychosocial assessment [12]. In addition, studies have reported that psychosocial assessment could minimize harm for the potential donor [13].

A systematic review identified 6 psychosocial items regarding organ donors: 1. personal resources, 2. motivation and decision making, 3. psychopathology, 4. social resources, 5. ethical and legal factors, and 6. information and risk processing [14]. Thys et al [15] conducted a systematic review on the psychosocial impact of pediatric living donor kidney and liver transplantation on donors, recipients, and families. Duerinckx et al [11] studied the donor predonation psychosocial evaluation. It is unfortunate that there has not been a systematic review of psychosocial assessment in the pediatric LT donor. We conducted a systematic review of psychosocial assessment of pediatric LT donors by searching published guidelines, clinical trials, reviews, meta-analyses, and randomized controlled trials. First, we sought to locate and summarize donor psychosocial assessment results before and after transplantation and to explore and determine the psychosocial status of donors. Second, we sought to identify the domains of psychosocial problems that should be addressed. Researchers around the world are interested in these issues. Third, we wished to identify psychosocial assessment tools, determine the items they measure, and indicate which tool is commonly used and can be promoted. Finally, we hoped to explore items that should be included in future psychosocial assessments tools and where focus should be directed so donors receive early recognition of psychosocial issues and assistance can be provided as needed for achieving and maintaining a good psychology condition.

METHODS

This systematic review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement for reporting items [16].

Data Sources

We searched the PubMed, Medline, Cochrane Library, Embase, Web of Science, and Google Scholar databases for publications from the January 1, 1990 to July 1, 2019, by using Medical Subject Headings (MeSH): pediatric, child, young, minors, adolescents; liver transplantation, transplantation liver, hepatic transplantation, donor, donors, donate, donation; psychosocial, psychology, emotional, mental; then we made a search related to the articles found in our first search.

Study Selection

Two researchers independently screened all titles and abstracts. They then removed duplicate articles and screened the full text of the remaining articles. Next, they chose the articles to include and screened the "related to" references. In the process, if they had an inconsistent decision on including an article, they consulted the third researcher.

1. We included published English-language studies; 2. the study methods included qualitative studies (structured or semi-structured review) and quantitative studies (ie, questionnaire survey, Delphi survey); 3. the study participants had to include pediatric LDLT donor candidates (≥ 18 years); 4. the study included psychosocial assessment contents, methods, and results; and 5. the donors had to be alive after transplantation. We excluded 1. articles for which we did not have the full text; 2. systematic reviews, letters, books, and abstracts; 3. articles not written in English; 4. cases in which the donor was deceased; and 5. publications from before the 1990s.

Reporting Quality

Two researchers independently appraised the quality of the reporting using the appraisal tool published on the Joanna Briggs Institute (JBI) website (<https://wiki.joannabriggs.org/>). The quantitative study used the JBI Prevalence Data Critical Appraisal Tool, which consists of 9 areas, including the simple frame and size, participants sampled, study subjects, data analysis, statistical analysis, valid and correct methods, and the response rate. The qualitative study used the JBI Critical Appraisal Checklist for Qualitative Research, which includes the stated philosophical perspective, research methods, research questions, data collection, analysis methods, the congruity between the research methodology and the interpretation of results, the influence of the researcher, adequately represented participants' voices, correct ethical and reasonable conclusion. Each question has 4 answers: Yes, No, Unclear, and Not applicable; the "Yes" rate of each study represents the total score. If the appraisal results given by the two reviewers were different, the third researcher took part in appraisal of the reporting quality [17].

Data Extraction

We extracted the following source items: the first author, published year, study region, living donor-recipient relation, study methods, assessment results (Table 1), tools of psychosocial assessment and content measured (Table 2), and psychosocial domains that require the most attention and indicate issues to be resolved (Table 3).

Table 1. Main Characteristics of the Included Studies

First Author	Year of Publication	Region	Sample (n)	Donor Relation to Pediatric Recipients	Study Methods	Assessment Time (Preoperative or Postoperative)	Study Results
Goldaracena [34]	2019	Canada	50	No relation	Questionnaires, semi-structured interview	Postoperative	Anonymous live liver donation (A-LLD) identified most with the personality traits of agreeableness and conscientiousness. No A-LLD reported regretting the decision.
Zhang [24]	2019	China	154	–	Questionnaires	Postoperative	The occurrence of post-traumatic stress disorder was common in living donors after pediatric liver transplantation. Severity of post-traumatic stress symptoms was significantly associated with a poorer quality of life after transplantation.
Weng [25]	2018	China	222	Parents	Questionnaires	Preoperative	The living donor candidates who withdrew from the selection process had obvious ambivalence, poorer family relationships, and insufficient emotional social support.
Wu [8]	2018	China	1210	Parents	Semi-structured interview, multichoice self-reported inventory	Preoperative	Greater anxiety and depression may be exhibited by parent donors because the distress from fears of death or illness of the recipients or their guilty feeling about their child.
Massey [18]	2018	Netherlands	12	–	Questionnaires, semi-structured interview	Preoperative	The ePAT addressed the need for more concrete guidance in the area of psychosocial screening of living organ donors.
Erim [21]	2017	Germany	85	–	Questionnaires, interviews	Preoperative	The results substantiate good psychometric properties of the revised (diagnoses corrected) TERS.
Shen [35]	2016	China	97	–	Questionnaires	Postoperative	Donors in the 1- and 2-year groups had poorer mental health domains than did the general population of Taiwan ($P < .05$).
Kimura [5]	2015	Japan	142	Parents	History-taking and screening and interview	Postoperative	A total of 6 (4.2%) donors developed the following psychiatric complications after transplantation: major depressive disorder ($n = 2$), panic disorder ($n = 2$), conversion disorder ($n = 1$), and substance use disorder ($n = 1$).
Iacoviello [19]	2015	United States	99	–	Semi-structured interviews	Preoperative	The Live Donor Assessment Tool (LDAT) was found to have good internal consistency and interrater reliability and showed signs of validity: LDAT scores differentiated the positive vs negative outcome groups.
Goldschmidt [26]	2015	United States	148	Parent, sibling, grandchild, niece, nephew	Questionnaires	Preoperative	Potential living liver donors need to have adequate, sufficient, and empathic information and be provided a supportive framework, including family support, to promote their well-being.
O'Connor [9]	2015	United States	15	Parent, aunt, cousin, sibling	Semi-structured interviews	Postoperative	Healthy donors are getting used to being patients.
Lai [22]	2014	China	100	–	Questionnaires	Preoperative	Ambivalence is common among living liver donor candidates. Instrumental social support can ameliorate the negative effect of donation-related concerns.
Bucak [27]	2014	Turkey	151	–	Questionnaires	Postoperative	Mild frontal lobe dysfunction may be present in liver donors at 1 wk after surgery, and postoperative attention problems may be experienced by donors.
Rudow [39]	2014	United States	835	Parent-child	Questionnaires	Postoperative	Live donors are resilient and show adaptive personality traits.
Nasr [42]	2014	United States	13	Parent-child	Semi-structured interviews	Postoperative	The impact donation had on the donors' lives was one of transformation.

Table 1. (continued)

First Author	Year of Publication	Region	Sample (n)	Donor Relation to Pediatric Recipients	Study Methods	Assessment Time (Preoperative or Postoperative)	Study Results
Erim [36]	2012	German	168	Parent-child	Questionnaires	Preoperative	Compared with healthy controls, parents donating for their children were significantly less stressed before LDLT and demonstrated fewer anxiety ($P < .01$) and depression symptoms ($P < .05$).
Narumi [40]	2012	Japan	31	—	Questionnaires	Postoperative	We must pay attention to depression and anxiety among living donors. More care should be focused on pain control and sharing of information on postoperative courses.
Jin [28]	2012	China	92	—	Questionnaires	Postoperative	HRQOL and psychological outcome were favorable in living liver transplant donors after donation, specifically in sex, age, time since operation, recipient health condition, and employment after donation, influenced postoperative QOL.
DiMartini [29]	2012	United States	77	—	Questionnaires	Preoperative	Ambivalent donors were the most distinct, having difficulties and concerns across most areas from their motivations for donating, to deciding to be tested and to donate, to concerns about the postdonation outcomes.
Nickels [20]	2011	United States	416	—	Questionnaires	Preoperative	Given the primacy of psychosocial and ethical issues in living liver donor candidate evaluation, the multiple-interview process, followed by team discussion and overseen by an ethicist removed from other transplant program functions, has advantages as a donor assessment model.
Uehara [30]	2011	Japan	165	Parent-child	Semi-structured interview and questionnaires	Preoperative	Those who have high trait anxiety or alexithymia may tend to take a “postponement” pattern in the individual decision-making process and a “de facto decision” pattern in the family decision-making process.
López-Navas [37]	2011	Spanish	70	—	Questionnaires	Preoperative	Nearly a quarter of patients on the liver transplant waiting list have social/family support that is nonfunctional, which leads to greater emotional psychopathologic symptoms that would need to be treated.
Gökçe [38]	2011	Turkey	32	Parents , grandmother, grandfather, cousin, sibling	Description	Preoperative and postoperative	19.3% of donors had anxiety regarding postoperative complications and quality of life, and psychological disturbance and abnormal family functioning are frequently observed during the post-transplant period.
Schulz [31]	2009	United States	43	—	Questionnaires	Postoperative	Actual donors showed a better mental QOL postoperatively than potential donors.
Shibata [41]	2009	Japan	6	Parent-child	Questionnaires	Preoperative and Postoperative	The donors' Profile of Mood States (POMS) anger/hostile score decreased significantly after transplantation, and the STAI score suggested that donors had little anxiety or depression after the operation.
Kroencke [32]	2006	German	36	Parent-child	Questionnaires	Postoperative	Donor QOL was significantly higher than the German normative sample. Anxiety and depression were significantly lower compared with those of healthy controls.

Walter [23]	2005	German	52	Parent-child	Questionnaires	Preoperative and postoperative	The resection of the right hepatic lobe holds promise of a good psychosocial outcome, with stable self-image and self-esteem for most donors. A minority of donors exhibited enhanced perception of distress and low self-esteem before and after surgery, which can easily be overlooked in the preoperative evaluation.
Walter [33]	2002	German	47	Parent-child	Semi-structured interview and questionnaires	Preoperative and postoperative	The operation holds promise of a good psychosocial outcome for most donors, irrespective of donation-related complications. The pronounced complaints appear to indicate psychological tension and distress in some donors after donation.

Abbreviations: ePAT, Electronic Psychosocial Assessment Tool; HRQOL, health-related quality of life; QOL, quality of life; STAI, State-Trait Anxiety Inventory; TERS, Transplant Evaluation Rating Scale.

RESULTS

Study Characteristics

We selected 28 articles for inclusion (Fig 1). Of the studies, 3 included pediatric LT donor in the objective. The other studies focused on LT and included pediatric and adult LT. We included studies conducted between 2002 and 2019, originating from the United States (25.6%), China (21.4%), Germany (17.9%), Japan (14.3%), Turkey (7.1%), Netherlands (3.6%), and Canada (3.6%). Of the studies, 18 used questionnaire survey methods (64.3%), 5 studies used the questionnaire survey and semi-structured interview methods (17.6%), 3 studies used semi-structured interviews (10.7%), 1 used description methods (3.6%), and 1 used history-taking and interview (3.6%). Of the studies, 12 were conducted preoperatively (42.9%) and 12 postoperatively (42.9%); 4 studies assessed the donor psychosocial condition during preoperative and postoperative periods (14.3%). Fifteen (53.6%) studies indicated that the donor-recipient relationship was parent with child; the remaining studies did not mention the donor-recipient type. Three (10.7%) studies were designed to develop a psychosocial assessment tool [18–20], 1 (3.6%) investigated the psychometric properties of a diagnoses-corrected version of The Psychosocial Transplant Evaluation Rating Scale (TERS) (items 1 and 2 omitted) [21], and the other studies assessed the donor psychosocial condition.

Study Quality

Two reviewers assessed study quality; the consistency of the evaluation results was >90%. The third reviewer joined the discussions and provided the final results (Tables 4 and 5). The study quality was moderate to high. There were 26 quantitative studies that used the JBI Prevalence Data Critical Appraisal Tool. Of these studies, 3 met all critical appraisal criteria [22–24]; 14 studies met 8 criteria, besides questions no.3 and no.9 had negative scores [5,8,19,21,25–34]; and 6 studies met 7 criteria, while questions no.3, no.4, and no.9 had negative scores [18,20,35–38]. The studies by Rudow et al [39], Narumi et al [40], and Shibata et al [41] met 6 criteria, with questions no.3, no.4, and no.9 had negative scores. All studies had a positive score in the sample frame, participants sampled in an appropriate way, data analysis, methods used for the identification of the condition, condition measured, and statistical analysis. Two-thirds of studies did not mention the response rate, and 6 studies had a low response rate [25,28,29,31,35,36]. Goldaracena et al [34], Zhang et al [24], Lai et al [22], and Walter et al [23] had a positive response rate. Qualitative studies by Nasr and Rehm [42] and O'Connor et al [9] used the JBI Appraisal Checklist for Qualitative Research and met 6 critical appraisal criteria but had a negative score in congruity between the stated philosophical perspective and the research methodology, the researcher cultural orientation, the influence of the researcher's ethics, and whether the research was conducted ethically.

DONOR PSYCHOSOCIAL ASSESSMENT RESULTS

Preoperative Psychosocial Assessment Results

Ambivalence (n = 3). Donors usually have psychological issues regarding ambivalence when making a donation decision. For example, Weng et al [25] and Lai et al [22] showed that before surgery the donor had obvious ambivalence. Another U.S. study, published in 2012, indicated that ambivalent donors were the most distinct in having difficulties and concerns regarding donation [29].

Anxiety (n = 4). When parents are the LT donors, they experience more anxiety and depression. Wu et al [8] explained that parents have distress about child's death or illness, and they feel guilt about their child. Gökçe et al [38] explained that donors have anxiety because of postoperative complications and declining quality of life. In contrast, assessment results reported by Erim et al [36] showed that when parents are donors, compared with healthy controls, they experience significantly less stress, less anxiety, and fewer depression symptoms. Moreover, another study reported that donors who have high trait anxiety or alexithymia when making decisions may have a pattern of postponement [30].

Needs of family and social support (n = 4). Four of the studies referred to social or family support. Social and family support are essential before surgery. For example, a Chinese study found that social support can mediate some negative concerns [22]; another U.S. study indicated that donors should have family support and a supportive framework to improve their well-being [26]. The psychosocial assessment results from Weng et al [25] showed that donors who withdrew from the selection process would have worse family and social support, and an earlier study indicated that nonfunctional social or family support leads to psychopathologic emotional symptoms [37].

Need for adequate information (n = 1). Sufficient information can relieve donor pressure. Goldschmidt et al [26] explained that the donor should get adequate, sufficient, and empathic information before surgery.

Distress and low self-esteem (n = 1). Some donors exhibited distress and low self-esteem. The study by Walter et al [23] showed that emotion could be easily overlooked during the psychosocial assessment.

Postoperative Psychosocial Assessment Results

Poor psychology condition (n = 6). Donors may experience mood issues after transplantation. Zhang et al [24] reported that post-traumatic stress disorder commonly occurs after transplantation. Kimura et al [5] showed in their study that 4.2% of donors developed psychiatric complications after surgery. Two studies found that donors experienced depression and anxiety after surgery and that there should be focus on their mental health [35,40]. A research team in Turkey indicated that psychological disturbance is frequently observed [38].

Bucak et al [27] reported that donors may experience attention problems.

Panic disorder, conversion disorder, and substance disorder (n = 1). A Japanese study reported that when parents were used as donors, 2 patients developed panic disorders, 1 experienced conversion disorder, and 1 had a substance use/abuse disorder after surgery [5].

Abnormal family functioning (n = 1). Gökçe et al [38] frequently observed abnormal family functioning after transplantation. We need to regularly assess family functioning during the postoperative period.

Better psychosocial outcome (n = 6). Six studies indicated that the donor had a better psychosocial outcome in the postoperative period [23,28,31–33,41]. For instance, Jin et al [28] reported assessment results showing the donor after donation had favorable psychological outcomes, and in a 2009 U.S. study, donors had better mental quality of life after the LT than did potential donors [31].

Personality traits (n = 2). Rudow et al [39] implied that donors were resilient and showed adaptive personality traits after transplantation. Goldaracena et al [34] did the first survey on anonymous live liver donation (A-LLD) and found that those taking the A-LLD survey had personality traits of agreeableness and conscientiousness.

Transformation (n = 2). Two qualitative articles mentioned "transformation." Nasr et al [42] indicated that when parents donate a partial liver to their child, the impact of donation is transformation, which includes 3 aspects: self-awareness process, clarification of familial relationships, and community perspective change. O'Connor et al [9] concluded that healthy donors adapt to being patients after transplantation.

Assessment Tools

The studies used 39 questionnaires that contained 34 psychosocial content items, ordered from most frequently occurring to least frequently occurring (Table 2); the most frequently used scale is the medical outcomes study item Short form Health Survey (SF-36) [25,28,31,32,36,40]. The SF-36 is an internationally accepted, high-reliability health questionnaire that includes questions on psychological, physical, and social aspects of quality of life. The psychosocial assessment contains questions on depression, anxiety, social and family support, motivation to donate, ambivalence, mood states, post-donation growth, etc. Among them, the most frequent psychological content of the scale assessment is anxiety and depression (eg, Beck Anxiety Inventory, Berlin Mood Questionnaire), followed by family and social support (eg, Family APGAR, Social Support Scale).

The Ambivalence subscale of the Donor Attitude Scale [21], the Ambivalence Scale [28], and the Donor Attitude Scale [23] are used to assess the ambivalence scale. The researchers also evaluated donor growth after donating by the Posttraumatic Growth Inventory Scale [27,34] and the Family Environment Scale [25]. Other researchers were

Table 2. Assessment Tools

Assessment Tools	Contents Measured
Beck Depression Inventory, 2nd edition [9,30]	Depression severity
Beck Anxiety Inventory [9]	Anxiety severity
The Hospital Anxiety and Depression Scale (HADS) [35]	Anxiety and depression
HADS (German version) [31,32,36]	Assessing anxiety and depression in physically ill persons
State-Trait Anxiety Inventory [30,42]	Anxiety
Toronto Alexithymia Scale [30]	Anxiety
Symptom Assessment-45 questionnaire [37]	Psychopathologic symptoms in 9 dimensions: somatizations, obsession and compulsivity, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism
Berlin Mood Questionnaire [23,33]	Elicit present moods in the dimensions of anxious depression, tiredness, anger, and elevated mood
Profile of Mood States [29,41]	Mood states
Short Form-36 Health Survey [24,25,28,31,32,36,40]	Self-assessment questionnaire measuring psychological, physical, and social aspects of quality of life
Symptom Check list-90 [28]	The psychological symptoms patterns of community, medical, and psychiatric respondents
Medical Outcomes Study: Social Support Survey [37]	Assesses the size of one's social network and 4 support dimensions: (1) emotional support; (2) material or instrumental support; (3) leisure and free-time social relations; (4) compassionate support, referring to expressions of love and care

Table 2. (continued)

Assessment Tools	Contents Measured
Transplant Evaluation Rating Scale [22]	Prior psychiatric history with Axis I and II disorders according to The Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R), substance use/abuse, compliance/adherence, health behaviors, quality of family and social support, history of coping, coping with disease and treatment, quality of affect and mental status
Social Support Questionnaire (The Perceived Social Support Questionnaire [F-SOZU]) [21]	Social support
Social Support Scale [25]	Emotional support, value support, instrumental support, informational support
Live Donor Assessment Tool [19]	Motivation for donation, knowledge about donation, relationship with the recipient, support available to the donor, feelings about donation, postdonation expectations, stability in life, psychiatric issues, alcohol and substance use
Deciding to donate [28]	Decision making to become a potential donor, such as how the person first learned about donation
Modified European Multicenter Study of Transplantation of Organs from Living Donors Questionnaire [30]	For living liver donors to gain knowledge about their decision-making process, health, and financial problems
Motives for donation [29]	Considers the potential donor's motives for donating across 19 items rated on a Likert scale from not at all true to very true
Ambivalence subscale of the Donor Attitude Scale [22]	Donation-specific ambivalence
Ambivalence scale [29]	Ambivalence

Table 2. (continued)

Assessment Tools	Contents Measured
Donor Attitude Scale [25]	Used to measure ambivalence, motivation, and expectations regarding living organ donation
Family Environment Scale [25]	Relationships, personal growth, and system maintenance
Post-traumatic Stress Disorder Self-rating Scale [24]	Post-traumatic stress disorder
Posttraumatic Growth Inventory [34,39]	Postdonation growth
Rosenberg Self-Esteem Scale [29]	Dealing with general feelings about themselves with respect to their self-image
Narcissism Inventory [23]	Investigation of self-image in disease and treatment
Connor-Davidson Resilience Scale [39]	Demonstrated strong psychometric properties and distinguishes between persons with greater and lesser resilience
Neuroticism Extraversion Openness Five-Factor Inventory (NEO-FFI) [34,39]	Measuring neuroticism (NEO-N), extroversion (NEO-E), openness to new experience (NEO-O), agreeableness (NEO-A), and conscientiousness (NEO-C)
Sense of Coherence Scale, German version [21]	The degree to which the person feels confident that life challenges will be comprehensible, manageable, and worthy of a commitment of self
Purpose in Life [39]	Measure the degree to which an individual perceives himself or herself to find meaning in his or her life at present
Concerns about donation [29]	Donation-related concerns about medical issues and psychosocial issues
Pearlin Mastery Scale [29]	The degree of control respondents feel they have in their life in general

Table 2. (continued)

Assessment Tools	Contents Measured
Giessen Complaint Questionnaire [23]	Dimensions of fatigue, upper abdominal complaints, limb pains, cardiac complaints, and an integrating scale for overall complaint pressure
Living Liver Donor Candidate Concerns Scale [25]	Physical concerns, financial concerns, and psychosocial concerns
Comparative Self-Assessment Scale [33]	Psychosocial parameters
Self-effectiveness, Optimism, and Pessimism Questionnaire (Fragebogen zu Selbstwirksamkeit, Optimismus und Pessimismus) [33]	Assess the factor of self-effectiveness (a person's belief in managing effectively his own affairs)
Relationship Questionnaire [35]	Adult attachment styles

concerned about donor psychosocial parameters (Comparative Self-Assessment Scale) [33] and meaning in life at present (Purpose in Life Scale) [27].

Resolution in Psychosocial Domain Issues

There are 17 different psychosocial domains referred to among the 28 studies, ordered from most frequently occurring to least frequently occurring (Table 4). Researchers most commonly focused on the family and social support problems among the psychosocial domains (25.0%). Lai et al [22] summarized that social support could mitigate donation-related concerns. Family and social support issues that should be addressed include emotional support, material or instrumental support, leisure and free-time social relations, and compassionate support. Other reported problems that should be resolved were fear of death, pressure, medical issues, physical concerns, self-image, ethical, and life-changing problems.

The contents of a positive psychological evaluation are a priority concern of the researchers (7.1%). The issues of concern were post-donation growth, confidence, and find meaning in life; however, the positive psychological condition often is ignored. We have a duty to help donors mobilize positive psychological experiences and maintain a healthy psychosocial status. Rudow et al [39] noted that a positive psychological status suggests a potential benefit for the donor.

DISCUSSION

This systematic review is the first of its kind as a psychosocial assessment of donors in pediatric LT donation. In

Table 3. Psychosocial Domains

Psychosocial Domains	Issues That Should Be Resolved in the Psychosocial Assessment of Liver Donors	%
Family and social support [6,22,25,26,37,38,41]	Emotional support, material or instrumental support, leisure and free-time social relations, compassionate support	25.0
Information [32,40,42]	Understanding of the donation process and associated risks	14.3
Donation pressure [9,18,29]	Fears of death or illness of the recipient, guilty feeling for their child	10.7
Motivation and decision-making [19,29,31]	Donor–recipient relationship, pressure, health and financial problems	10.7
Ambivalence [22,25,29]		10.7
Positive psychosocial characteristics [21,39]	Postdonation growth, confident, find life meaning	7.1
Concern [29,25]	Medical issues, psychosocial issues, physical concerns, financial concerns	7.1
Self-image [23,29]	Dealing with general feelings with respect to their self-image	7.1
Religion/culture [29,38]		7.1
Self-esteem [23]	Donors feel they have been attacked in their integrity and autonomy	3.6
Social resources [18]		3.6
Ethical [18]		3.6
Self-awareness [42]	Empowered the donor, construction of new identity	3.6
Clarified family relationships [42]	Preexisting relationships that were brought into a clearer focus after the donation	3.6
Changed perspectives on the meaning of community [42]	More acute awareness of community, desire to give back to community	3.6
Post-traumatic stress disorder [24]		3.6
Life changing [34]		3.6

contrast to the concentration of Duerinckx et al on living kidney and liver donor psychosocial evaluation [11], our aim was to summarize donor psychosocial assessment results, discover donor psychosocial domains that need to be addressed during the perioperative and postoperative period, and determine which psychosocial assessment item requires focus in the future.

The decision a donor makes in organ donation is challenging. The International Liver Transplant Society Guideline mentions that donor psychological assessment is essential [11]. Previous studies have shown that emotion can affect the secretion of cortisol, epinephrine, and norepinephrine, which regulate healing [43]. Donor negative emotions can be found and treated promptly through assessment, thereby reducing the risk for adverse outcomes resulting in changes in hormone levels. Because the recipient is the donor's child, the donor may have more complicated psychological issues. In 28 studies' assessment results, the quantity of poor psychological status was greater than that of healthy psychological status. Wu et al [8] proved that parent donors have increased anxiety and depression. In the reviewed studies, the researchers discovered that donors have ambivalence, anxiety, depression, stress, low self-esteem, nonfunctional family, or poor social support during the preoperative time. Over the postoperative period, the donor has poor psychological condition, panic, conversion disorder, substance use/abuse disorder, mild frontal lobe dysfunction, distress, attention problems and psychological disturbance. Moreover, the psychosocial

problems manifested in adaptive personality traits, abnormal family function, postdonation growth, mental function. To discover the psychosocial risks of donors and mobilize the positive psychological function of donors, it is necessary to conduct proper and timely psychosocial assessments.

Overall, it is difficult for the donor to make the decision on donation [44]. The donor–recipient relationship is at the center of the decision to donate [45]. The child's parents usually choose to donate to save the life of their child [46]. Sarigol Ordin et al [47] reported that the decision to donate was a source of stress when parents had to consider whether to become a liver donor. Some donors play the caregiver role after surgery, and, according to our survey, some mothers choose to resign from their job to take care of the child. Grunberg et al [48] reported that a family with fewer resources (eg, money) may experience increased stress. Researchers should address the donor psychosocial issues such as depression, anxiety, inadequate information, ambivalence, social and family support, and growth after transplantation.

The areas for psychosocial assessment are diverse, and it would be difficult, if not impossible, for a researcher to comprehensively assess all of the psychosocial issues. There are two reasons for this. First is the amount of time and work required to conduct a comprehensive psychosocial assessment and the lack of necessary human resources. Second is the required donor cooperation. An extensive assessment may result in an irritated, uncooperative donor.

We have a duty to help donors achieve and maintain a healthy psychosocial status by carefully selecting essential assessment content. Researchers around the world are focused on donor anxiety and depression, family and social support, decision-making, and ambivalence.

Our team included 5 psychosocial content areas in our systematic review: anxiety or depression, family and social support, ambivalence and information; and positive psychosocial characteristics. Among these content items, we advocate assessment of ambivalence during preoperative periods, evaluation of positive psychosocial characteristics after donation, and the remaining items examined over the perioperative period. A total of 5 studies, with 299 donor assessment results, demonstrated that donors had anxiety and another poor psychology status issue [5,8,30,35,40]. Helping donors achieve and maintain a healthy psychological status helps improve the response to surgery and assists in earlier rehabilitation. Studies from 4 countries (China, United States, Spain, and Turkey) reported that social and family support can ameliorate some negative concerns, improve donor well-being, and accompany donors through a difficult time [22,25,26,37,38]. Weng et al [49] found that

family support also can reduce donor ambivalence. The family environment changes after transplantation, so helping ensure the donor gets sufficient support is essential. Most donors experience ambivalence in deciding whether to donate. According to our team, some in the donor parent interview expressed hesitance in regard to whether to save their child's life or possibly damage their body image with the surgery. DiMartini et al [29] revealed that the donor who had the most ambivalence had more difficulties. We should select ambivalent donors and assist them in solving the problems.

Next, adequate information can help donors make the decision on whether to donate without hesitation and lessen anxiety regarding the surgery. Gordon et al [50] in a systematic review confirmed that liver donors may lack information about postoperative recovery and complications. Our team advocates investigating donor information needs by assessment and helping them become more informed. Finally, donors may have a better psychological status than those who do not participated in donating. Shibata et al [41] explained that some donors feel a sense of achievement after transplantation. Rudow et al [39] mentioned that the

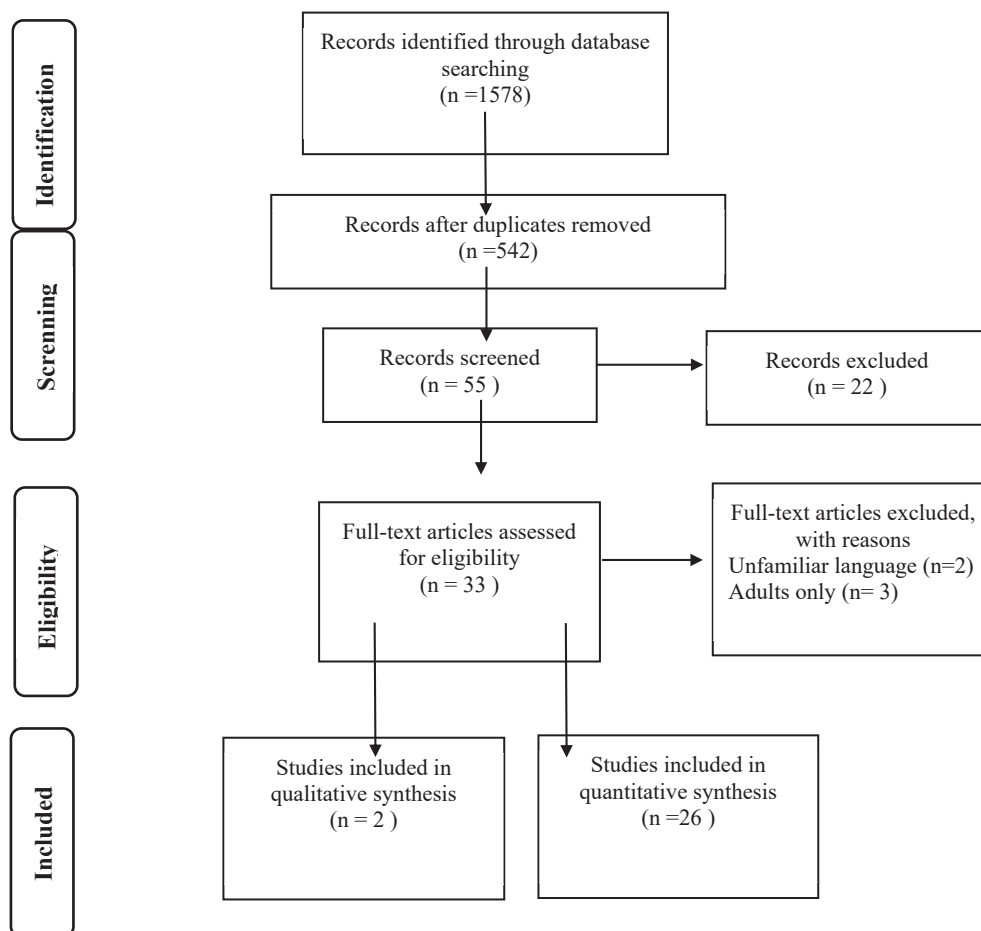


Fig 1. Flow chart of the study selection process.

Table 4. Quality of Quantitative Studies

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Total Score
Goldaracena [34]	Y	Y	N	Y	Y	Y	Y	Y	Y	8/9
Zhang [24]	Y	Y	Y	Y	Y	Y	Y	Y	Y	9/9
Weng [25]	Y	Y	Y	Y	Y	Y	Y	Y	N	8/9
Wu [8]	Y	Y	Y	Y	Y	Y	Y	Y	U	8/9
Massey [18]	Y	Y	N	Y	Y	Y	Y	Y	U	7/9
Erim [21]	Y	Y	Y	Y	Y	Y	Y	Y	U	8/9
Shen [35]	Y	Y	Y	N	Y	Y	Y	Y	N	7/9
Kimura [5]	Y	Y	Y	Y	Y	Y	Y	Y	U	8/9
Iacoviello [19]	Y	Y	Y	Y	Y	Y	Y	Y	U	8/9
Goldschmidt [26]	Y	Y	Y	Y	Y	Y	Y	Y	U	8/9
Lai [22]	Y	Y	Y	Y	Y	Y	Y	Y	Y	9/9
Bucak [27]	Y	Y	Y	Y	Y	Y	Y	Y	U	8/9
Rudow [39]	Y	Y	N	N	Y	Y	Y	Y	U	6/9
Erim [36]	Y	Y	Y	N	Y	Y	Y	Y	N	7/9
Narumi [40]	Y	Y	N	N	Y	Y	Y	Y	U	6/9
Jin [28]	Y	Y	Y	Y	Y	Y	Y	Y	N	8/9
DiMartini [29]	Y	Y	Y	Y	Y	Y	Y	Y	N	8/9
Nickels [20]	Y	Y	Y	N	Y	Y	Y	Y	U	7/9
Uehara [30]	Y	Y	Y	Y	Y	Y	Y	Y	U	8/9
López-Navas [37]	Y	Y	Y	N	Y	Y	Y	Y	U	7/9
Gökçe [38]	Y	Y	N	Y	Y	Y	Y	Y	U	7/9
Schulz [31]	Y	Y	Y	Y	Y	Y	Y	Y	N	8/9
Shibata [41]	Y	Y	N	N	Y	Y	Y	Y	U	6/9
Kroencke [32]	Y	Y	Y	Y	Y	Y	Y	Y	U	8/9
Walter [23]	Y	Y	Y	Y	Y	Y	Y	Y	Y	9/9
Walter [33]	Y	Y	Y	Y	Y	Y	Y	Y	U	8/9

Questions are as follows:

Q1: Was the sample frame appropriate to address the target population?

Q2: Were study participants sampled in an appropriate way?

Q3: Was the sample size adequate?

Q4: Were the study subjects and the setting described in detail?

Q5: Was the data analysis conducted with sufficient coverage of the identified sample?

Q6: Were valid methods used for the identification of the condition?

Q7: Was the condition measured in a standard, reliable way for all participants?

Q8: Was there appropriate statistical analysis?

Q9: Was the response rate adequate, and if not, was the low response rate managed appropriately?

Abbreviations: N, no; Q, question; U, unclear; Y, yes.

experience of donation was perceived as positive. Chang et al [51] observed that donation played an inspiring role in repeat donation. If we can help donors attain a positive psychological status, they will soon experience relief from anxiety or depression.

In summary, donors should be declined if the psychosocial assessment results showed poor family support, poor psychological status (eg, anxiety, depression), severe

ambivalence, or insufficient information before surgery. It is similar to research by Duerinckx et al [11] that excluded donors who had motivation-related factors, some kind of coercion or pressure to donate, psychiatric disorders, ambivalence, or unrealistic expectations.

The researcher usually employs questionnaires to conduct donor psychosocial assessment. Different questionnaires can evaluate different psychosocial domains. Researchers

Table 5. Quality of Qualitative Studies

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total Score
O'Connor R [10]	Y	Y	Y	Y	Y	N	U	Y	N	Y	7/10
Nasr [42]	N	Y	Y	Y	Y	N	U	Y	N	Y	6/10

Questions are as follows:

Q1: Is there congruity between the stated philosophical perspective and the research methodology?

Q2: Is there congruity between the research methodology and the research question or objective?

Q3: Is there congruity between the research methodology and the methods used to collect data?

Q4: Is there congruity between the research methodology and the representation and analysis of data?

Q5: Is there congruity between the research methodology and the interpretation of results?

Q6: Is there a statement locating the researcher culturally or theoretically?

Q7: Is the influence of the researcher on the research, and vice versa, addressed?

Q8: Are participants, and their voices, adequately represented?

Q9: Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?

Q10: Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?

Abbreviations: N, no; Q, question; U, unclear; Y, yes.

can not only identify donor psychosocial domain issues (eg, depression, anxiety, family and social support) through the assessment questions but also can determine the degree of the problems by questionnaire score results. The choice of questionnaire is essential. To date, there is no universal pediatric LT donor psychosocial assessment scale. Massey et al [18] studied the living organ donor electronic Psychosocial Assessment Tool (ePAT), which addresses living organ donor needs regarding concrete guidance of psychosocial screening. However, it has not yet achieved popular use in pediatric LT donor psychosocial assessment.

Survey questionnaires could not express all emotions of the donor. The semi-structured interview may help the researcher solve this problem. The researcher can identify areas such as donor needs, the source of anxiety, and the reason for ambivalence. For example, Gordon et al [52] learned that donors preferred to receive transplantation risk information by interview. We advocate assessing donor psychosocial status using questionnaire survey and semi-structured interview methods, which can help donors resolve difficulties or needs.

Our research has some shortcomings. First, we are not competent to distinguish donor psychosocial outcomes between pediatric LT and adult LT. Most of the included studies chose both pediatric and adult LT donors as candidates. Second, the study methods contained the questionnaire survey and semi-structured interview, which are subjective indicators. We could not ensure the authenticity of the results. Finally, most studies were published before 2015. Few researchers have focused on psychosocial issues in recent years.

Future research is needed to increase the number of pediatric LT donor candidates, reduce bias, create specific psychosocial assessment tools for pediatric LT donors, and help donors achieve and maintain a healthy psychosocial condition during the transplantation period. This systematic review includes donor psychosocial assessment content areas, time and methods, donor psychosocial condition, and the psychosocial areas requiring attention. Findings from this review could be used to improve donor psychosocial assessment and inform guidelines for psychosocial assessment.

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