

REVIEW

Psychiatric comorbidities in pediatric organ transplantation: Current findings and clinical approaches

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Abstract

Although pediatric organ transplantation is a critical, life-saving medical intervention that can markedly improve a child's quality of life, it also presents substantial psychosocial challenges for both children and their parents. Psychiatric comorbidities such as anxiety disorders, depression, post-traumatic stress disorder (PTSD), and delirium are frequently observed throughout the transplantation process. Contributing factors include medical uncertainties before and after surgery, prolonged hospitalizations, neuropsychiatric effects of immunosuppressive therapy, and social isolation. Parents similarly face high levels of stress, anxiety, and an increased risk of depression, which can negatively affect family dynamics and financial stability. This review examines the most common psychiatric comorbidities in pediatric transplant recipients, their clinical implications and management strategies, as well as parental psychiatric outcomes, family functioning, and related risk factors. The reviewed studies cover patients from various organ transplant groups and different stages of the transplantation process. Despite heterogeneity across findings, consistent evidence highlights the presence of mental health symptoms in both patients and caregivers. In addition to internalizing and externalizing symptoms, cognitive impairments have also been reported. Post-transplant quality of life in pediatric recipients is influenced by parental well-being, family functioning, transplant type, medication adherence, and pre-transplant mental health status. Thus, focusing solely on medical outcomes is insufficient in pediatric organ transplantation. Emphasizing psychiatric evaluation, multidisciplinary collaboration, and access to psychosocial support is essential to improve adjustment and long-term prognosis.

Keywords: Pediatric organ transplantation, immunosuppression, child and adolescent psychiatry

MOrgan transplantation is essential for prolonging the lives of patients with organ failure. Neonates, children, and adolescents may all be candidates for organ transplantation, as well as potential donors. Tragically, some children and adolescents die while waiting for an organ transplant, with the highest mortality rate observed among those under one year of age [1]. Since the first successful

kidney transplant, solid organ transplantation has become an integral part of pediatric care. Advances in surgical techniques and improvements in immunosuppressive therapies have led to better outcomes and significantly increased long-term survival rates. Currently, the five-year survival rate is over 75% for pediatric heart and liver transplant recipients and over 90% for pediatric kidney transplant recipients [2].



Pediatric healthcare professionals and mental health specialists play a critical role in addressing the challenges encountered during the organ donation and transplantation process by building trust-based relationships with families and adolescents. They are also uniquely positioned to contribute to shaping public policies related to organ procurement, allocation, and scarcity. Child and adolescent psychiatrists not only provide direct clinical services but also offer counseling to transplant care teams, deliver mental health education, and support care coordination when necessary. They actively participate in the evaluation of potential transplant recipients and monitor post-transplant adaptation and health-related quality of life. Additionally, they address concerns related to informed consent, ethical dilemmas, developmental factors, medication adherence, comorbid psychiatric diagnoses, pain management, and procedural anxiety for patients, families, and the transplant team.

For this purpose, studies involving patients from different organ transplant groups and at various stages of the transplant process were selected. While some studies focus on transplant recipients, others examine the psychiatric effects on caregivers. Although the review primarily covers recent literature, older studies were also included to broaden the evaluation.

Pre-Transplant Psychiatric Evaluation

During the pre-transplant period, patients undergo comprehensive psychiatric and psychometric evaluations. The primary goals are to enhance understanding of the illness and transplantation process for the patient, parents, and family members; assess the psychiatric suitability of the patient for transplantation; evaluate existing psychosocial support systems; and identify and treat any comorbid psychiatric diagnoses [3].

In this phase, families face numerous challenges, including long waiting times due to the scarcity of organ donations, financial difficulties, stress on siblings and caregivers (due to changing roles and responsibilities), and the burden of complex medical regimens despite the child's ongoing illness [4]. During psychiatric evaluation, the family's socioeconomic status should be considered, and the need for additional support before transplantation should be assessed. If necessary, the assistance of a social worker should be sought.

The presence of comorbid psychiatric diagnoses negatively affects both the course of chronic physical illnesses and the treatment process. Prolonged hospitalizations may create additional stress and challenges not only for the patient but

Highlights

- Pediatric organ transplantation imposes significant psychosocial burdens on both children and families
- Psychiatric comorbidities in recipients and stress in parents directly affect post-transplant outcomes
- Multidisciplinary psychiatric evaluation and psychosocial support improve adaptation and prognosis

also for family members. While psychiatric comorbidities do not constitute an absolute contraindication for pediatric transplantation, psychiatrists must evaluate factors such as active alcohol or substance use, severe psychopathology, poor medical adherence, risky health behaviors, and inadequate social support. These findings should be carefully discussed by the entire transplant team regarding the appropriateness, feasibility, and timing of transplantation [5].

The transition from hospital to home involves the resumption of physical activity, improvement in dietary habits, return to school, management of potential cognitive deficits, and enhancement of quality of life. Parental and family functioning are directly linked to significant health factors such as adherence to treatment, readiness for discharge, and frequency of hospitalizations [5].

Psychiatrists play a critical role in identifying factors that may affect a family's ability to provide adequate emotional and social support. In this context, they act as a bridge between the transplant team and the family. Parents often experience heightened anxiety and post-traumatic stress symptoms during their child's transplant process. A careful and supportive psychiatric approach can help families better understand their emotional responses and cope with their child's life-threatening illness [3]. High levels of depression and post-traumatic stress in caregivers, as well as family functionality, are closely linked to pre- and post-transplant adaptation [3]. Therefore, psychiatrists should evaluate both the child's knowledge and expectations about their illness and treatment, and the family's functionality and social support network.

Comprehensive developmental history and cognitive assessment are also essential. Children with underdeveloped cognitive functions may not fully understand the transplant procedure and may perceive it as a "punishment." Additionally, these children may experience academic delays due to illness. Cognitive functioning should therefore be assessed in all children with organ failure. For instance, children with congenital heart disease frequently exhibit cognitive and developmental anomalies [6].

The psychosocial status prior to transplantation is strongly associated with post-transplant emotional outcomes. This underscores the importance of early identification and management of psychosocial problems before surgery [7]. A history of alcohol or substance abuse in the patient or family has been linked to a higher risk of substance dependence after transplantation, particularly in adolescent patients who should be carefully evaluated [7]. Identifying comorbid psychiatric conditions plays a vital role in managing the pre-transplantation process and improving post-transplant prognosis, thereby enhancing quality of life [3].

Adherence to treatment for chronic illness before transplantation is an important predictor of post-transplant adherence. Studies have shown that patients who fail to comply with hospital visits and treatments before transplantation are more likely to continue this pattern afterward. Indeed, non-adherence is considered a greater risk factor for poor outcomes than immunosuppression, one of the most common complications [8]. At this stage, adherence to medical treatment is one of the most critical determinants of graft survival. Therefore, identifying risk factors that may affect adherence and addressing them without delay is of paramount importance [9].

Transplantation Process

The transplantation process is a comprehensive sequence consisting of interconnected stages: decision-making and preparation, listing and waiting, surgery and hospitalization, and post-transplant adaptation. The first stage is the decision-making process for organ transplantation and the preparation phase. In this stage, psychiatrists assist the child and parents in making informed decisions. Children typically adapt more easily to the process with the help of clear and understandable explanations from the medical team. The use of transplant education materials during this phase can also be highly effective [4].

Routine health check-ups provide opportunities for proactive guidance, allowing children and adolescents to learn about organ donation and, when appropriate, engage in direct discussions on the topic. During late adolescence, individuals develop a stronger sense of identity and a clearer understanding of their beliefs, values, and priorities. This is a critical phase for making informed and independent decisions, including those related to organ donation. Children and adolescents with intellectual or developmental disabilities should not be excluded from these discussions and should be involved in the process whenever possible [2]. Conditions such

as intellectual disability or autism spectrum disorder (ASD) do not constitute definitive contraindications for transplantation. Psychiatric evaluation not only facilitates early identification of potential resistance and risk factors but also ensures ongoing monitoring of patients' coping skills throughout the transplant process [10].

Once the transplant decision is made, the patient is placed on the transplant list, and the waiting process begins. This period often brings intense anxiety for both the child and parents [11]. The duration between being listed and undergoing surgery is uncertain, and during this time medical complications may arise. Therefore, all potential stress factors should be carefully assessed. Additionally, feelings of anger, frustration, and competition may emerge regarding the organ allocation process, further complicating parental coping and increasing their need for psychological support. Financial concerns can also exert significant stress on the family [12].

When a donor is finally found, families often experience mixed emotions, including relief, gratitude, and heightened anxiety regarding the surgical process. Providing psychosocial support at this stage can help families navigate these emotions and manage the process more effectively.

Post-Transplantation Process and Psychosocial Factors

Advances in transplantation medicine have significantly improved allograft function, patient survival, and quality of life. However, transplantation should not be viewed solely as a single surgical event, since post-transplant complications may affect multiple organ systems beyond the transplanted organ itself. Recipients are at a much higher risk than the general population of developing comorbidities such as cardiovascular disease, obesity, infection, malignancy, and chronic kidney disease [2].

In the early post-surgery period or during subsequent hospital readmissions, psychiatrists should be alert to acute changes in mental health. This early phase is particularly challenging as patients undergo intensive medical treatments, often requiring prolonged isolation with a caregiver due to infection risks. Following this stage, adaptation of both the child and family becomes critical. Transplant recipients must adhere to strict treatment regimens, including regular medication use, frequent follow-up visits, and procedures such as biopsies and catheterizations. Some parents describe this experience as "adapting to a new disease called organ transplant" [13].

Beyond physical recovery, the process imposes complex developmental and emotional challenges that create a

significant psychosocial burden on both the child and the family system. Children often struggle to express their fears of rejection, especially if they lack effective coping mechanisms. Anger, guilt, helplessness, and hopelessness are common emotional responses [14]. Psychiatrists must also carefully evaluate the use of psychotropic medications, considering their interaction with immunosuppressive treatments. Corticosteroids, in particular, are well known to induce mood changes and depressive symptoms depending on dosage [15].

Post-transplant, children may also face challenges in adopting their new “healthy” identity, which can negatively affect their academic functioning [16]. Long-term studies on pediatric liver transplant recipients show increased risks of learning difficulties, cognitive delays, and academic setbacks [17]. Moreover, the fact that many transplant recipients come from remote or underserved areas poses challenges for post-discharge care planning. Outpatient psychiatric follow-up may therefore play a critical role in mitigating psychosocial consequences [18].

Psychiatric Conditions After Organ Transplantation in Children and Adolescents

Children who undergo transplantation frequently experience psychiatric conditions, including anxiety, depression, and behavioral problems, though prevalence and presentation vary across studies. Concerns about body image and self-esteem are common in children with chronic physical illnesses and may become particularly pronounced during adolescence, when peer relationships and social acceptance are central [19]. After transplantation, children not only worry about their physical appearance and growth but also about repeated hospitalizations. Prolonged hospitalization often leads to fear of injections, with a higher prevalence among girls [20]. Although such fears rarely interfere with adherence, they represent an important factor for long-term adjustment [21].

In kidney transplant recipients, introverted symptoms and mild behavioral problems have been observed [2]. Similar findings of psychological difficulties have been reported among liver transplant recipients [22]. Conversely, some studies have noted no significant behavioral differences between transplant recipients and healthy peers; for example, one study reported no significant behavioral issues among children post-liver transplantation [23].

Differences in psychiatric outcomes are largely attributed to variables such as gender, age at transplantation, time since transplant, and type of organ transplanted. Studies focusing on younger children suggest that they are more likely to

experience elevated parental stress [24], since the medical management of young patients typically falls to parents, increasing the caregiving burden [25]. Younger children also tend to exhibit greater fear and anxiety toward procedures such as blood draws and hospital visits [26]. A recent study of pediatric liver transplant recipients found high rates of depression, anxiety, and post-traumatic stress disorder (PTSD). Interestingly, younger age was negatively correlated with anxiety symptoms [27]. However, other studies found no significant associations between child age, parental stress, or child gender and caregiver stress [28].

Disease stage and treatment duration also strongly influence psychiatric outcomes. For example, children who underwent kidney transplantation after prior hemodialysis showed greater psychiatric distress than those who had not received dialysis [2]. However, other studies have failed to confirm these associations, reporting no significant correlations between illness duration, age at transplantation, years post-transplant, and caregiver burden [29]. Earlier transplant cohorts demonstrated higher psychiatric symptom rates, but more recent multidisciplinary approaches—including psychiatric involvement—appear to have reduced these complications [2].

Psychiatric manifestations in this population are diverse, ranging from delirium and depressive or anxious symptoms to oppositional behaviors, impulsivity, suicidal ideation, enuresis, encopresis, and psychosomatic complaints (e.g., headache, abdominal pain) [30]. Case reports describe depressive mood, anhedonia, and enuresis following heart transplantation [14]. Intensive care admissions also pose risks for delirium, with affected children often requiring prolonged mechanical ventilation, longer hospital stays, and facing lasting motor or behavioral sequelae [31]. Moreover, post-hospital trauma can result in PTSD [32]. A 2021 review (not limited to transplant patients) found PTSD symptoms in 16% of pediatric surgical patients and 23% of parents [32], while more recent reviews specific to transplant recipients confirm a high prevalence of PTSD [33].

Most studies to date have focused on kidney and liver transplant populations, with fewer investigations into heart, lung, intestine, and multi-organ transplant recipients. In lung transplant cohorts, high anxiety rates have been reported, and pre-transplant psychiatric comorbidities were strong predictors of post-transplant difficulties [34]. Likewise, among heart transplant recipients, pre-transplant psychological dysfunction was associated with poorer post-transplant adaptation [6]. While prolonged intensive care stays may delay access to psychiatric support in heart

and lung recipients [35], other studies suggest minimal psychosocial impact following lung transplantation [36].

Cognitive function assessment is critical both before and after transplantation. Children awaiting kidney transplants often exhibit cognitive impairments, but evidence suggests improvements following transplantation, though findings remain limited due to small sample sizes [37]. For example, earlier studies documented both declines in areas such as memory and learning and improvements in domains such as visual perception, verbal ability, and motor skills [38]. Other studies, however, have found persistent deficits in verbal and non-verbal IQ among transplant recipients [39]. Lower IQ scores have been associated with earlier initiation and longer duration of dialysis, as well as older age at transplantation [40]. Pre-transplant conditions such as anemia, prolonged dialysis, and immunosuppressive medications may also constrain post-transplant cognitive recovery [39].

Even before dialysis or transplantation, children with chronic kidney disease (CKD) are at heightened risk of academic failure [41]. This risk often persists after transplantation, affecting long-term educational and vocational outcomes. In one cohort, 9 out of 12 young adults with kidney transplants failed to complete college [42]. Executive function deficits—including difficulties in problem-solving, attention regulation, working memory, inhibition, and cognitive flexibility—are common. Mendley et al. reported improvements in processing speed, discrimination sensitivity, and working memory among medically stable pediatric kidney recipients [43]. However, more recent studies have demonstrated significant declines in processing speed post-transplant, especially in children transplanted at an older age (≥ 80 months) [38].

The findings are summarized in Table 1.

Family Dynamics and Parental Stress

Parents of children with chronic illnesses experience higher levels of parenting stress compared to parents of healthy children. Although pediatric transplant recipients were not included in some of these studies, research consistently shows that parental stress negatively affects children's mental health [44]. Elevated parental stress has also been linked to lower adherence to immunosuppressive medications after transplantation. In contrast, families with healthier functioning—both parents and adolescents—encounter fewer adherence barriers such as forgetfulness, scheduling difficulties, or intentional nonadherence [45].

The transplantation process profoundly affects not only children but also their families. Studies indicate

that nearly one-third of parents of pediatric transplant recipients develop symptoms of PTSD, regardless of the type of transplantation [46]. Similarly, parents of children who required a ventricular assist device (VAD) prior to heart transplantation reported high levels of anxiety and depressive symptoms [47]. Evidence suggests that caregivers with effective coping skills enhance both psychiatric adjustment and quality of life for transplant recipients [48]. Therefore, providing psychosocial support to parents as well as to transplant recipients is critical for parental mental health and the child's prognosis.

Increased family conflict has been associated with externalizing behavioral problems and reduced quality of life in children after kidney transplantation [44]. A large-scale review also confirmed that parental stress has a negative effect on medication adherence [3]. Family functioning is closely related to hospitalization and discharge preparation. Weaker family bonds have been shown to predict higher hospitalization rates, explaining 10.24% of the variance [44]. Minimizing disruptions to family routines and lifestyles has been associated with improved quality of life [49]. Nevertheless, some studies report no deterioration in family functioning post-transplant [50]. A supportive family environment reduces children's stress and may protect against psychiatric comorbidities [51].

Two separate studies with parents of pediatric liver transplant candidates found that stress levels were high before transplantation [52]. These findings were linked to family burden, financial strain, and disrupted family dynamics. Another study found that parents' anxiety levels were higher than their children's [20]. However, a long-term study of parents of liver transplant recipients (≥ 4 years post-transplant) reported that the disease's negative impact on family functioning was lower than in other pediatric chronic illness groups [53]. Conversely, another study with parents of liver transplant recipients 5–6 years post-transplant found that they experienced more financial difficulties, poorer coping, and a greater burden on siblings compared to families of children with other chronic diseases or disabilities [26].

Taken together, these findings highlight the importance of viewing the family as a whole and conducting psychosocial assessments before transplantation. Early evaluation enables the activation of social support systems before and during the transplant process. Evidence shows that pre-transplant social support and higher family quality of life contribute to better post-transplant survival outcomes [54].

The findings are summarized in Table 2.

Table 1. Psychiatric Conditions Following Organ Transplantation in Children and Adolescents

Study	Organ Type	Results
Reynolds et al. (1991)[2]	Kidney	It has been found that individuals receiving hemodialysis experience greater psychiatric effects compared to those who do not undergo this treatment. These effects can include both internalized symptoms, such as anxiety and depression, as well as externalized behaviors, such as aggression.
Henning et al. (1988)[21]	Kidney	Fear and anxiety during the transplantation process have been shown to affect long-term adjustment in patients.
Lullmann O et al. (2017)[37]	Kidney	Executive functions tend to decline post-transplantation, with factors such as receiving a transplant at an older age, having additional medical conditions, and long treatment durations playing a significant role in this decline.
Harshman et al. (2019)[41]	Kidney	Even before the need for dialysis or transplantation arises, children with chronic kidney disease are at risk of academic failure.
Murray et al. (2019)[42]	Kidney	It has been observed that patients' academic functionality continues to decline even after transplantation.
Mendley & Zelko (1999)[43]	Kidney	Improvements have been reported in the transplant patients' processing speed, reaction time, discrimination sensitivity, and working memory.
House et al. (1983)[22]	Liver	It was found that all children who underwent liver transplantation were affected psychiatrically.
Alonso et al. (2013)[23]	Liver	Although parents were affected after transplantation, they did not report behavioural symptoms towards their children.
Kaller et al. (2014)[26]	Liver	It was observed that frequent blood collection procedures and hospital appointments were quite challenging for both children and parents, and younger children were affected more frequently.
Duken&Yayan (2024)[27]	Liver	In liver transplant recipients, symptoms of depression, anxiety, and PTSD were observed to be prominent, and a negative correlation was found between the recipient's age and anxiety levels
Ozbaran et al. (2024)[10]	Heart	Although accompanying behavioural disorders in children with intellectual disability and autism do not constitute a contraindication for heart transplantation, they may constitute an obstacle for devices such as ventricular assist devices applied during the transplantation process.
Çelik et al. (2019)[14]	Heart	Depressive mood, anhedonia and enuresis were observed after heart transplantation.
Fedewa et al. (1996)[29]	Kidney and Liver	However, no significant relationship was found between pre-transplant disease duration, transplant age, years passed since transplantation, hospitalization frequency, and the caregiving burden on the family.
Lee JM et al. (2017)[40]	Kidney and Liver	The prolonged treatment process has been shown to contribute to cognitive impairments.
Penner et al (2022)[20]	Kidney, Liver and Heart	It has been observed that children develop a fear of injections as a result of prolonged hospital follow-up.
Ucgun&Çitak (2024)[33]	Kidney, Liver and Heart	Children who have undergone organ transplantation, PTSD was found to be prevalent
Wilson et al. (2016)[34]	Lung	It was found that anxiety levels were high and pre-transplant psychiatric status was an important factor in predicting the post-transplant process.
Bujoreanu et al. (2015)[35]	Heart and Lung	It was observed that long intensive care stay after transplantation delayed psychiatric evaluation.
Hirshfeld et al. (2004)[36]	Heart and Lung	The results showed that there was no psychiatric effect after transplantation.

PTSD: Post-traumatic stress disorder.

Conclusion

Pediatric organ transplantation, while a life-saving intervention that improves quality of life, imposes substantial emotional, psychological, and social

burdens on both children and their families. Psychiatric comorbidities such as anxiety and depression are common in children during this process. Key risk factors include medical uncertainties before and after transplantation, prolonged hospitalizations, neuropsychiatric effects of

Table 2. Parent and family functioning in pediatric organ transplantation

Study	Organ Type	Results
Cousino et al. (2017)[3]	Multiorgan Transplant	Parental stress was found to have a negative effect on medication adherence.
Simons et al. (2007)[28]	Multiorgan Transplant	The stress burden of parents during the transplantation process was not related to the age of their children.
Young et al. (2003)[46]	Multiorgan Transplant	Parents showed PTSD symptoms after transplantation, but the type of transplantation was not found to be effective in this.
Soliday et al. (2001)[44]	Kidney	It was observed that parental stress and family conflicts adversely affected child mental health and increased the number of hospitalisations.
Gerson et al. (2004)[45]	Kidney	It was observed that parents and adolescents with healthy family functioning experienced less obstacles such as forgetfulness and programming problems in medication use.
Fukunishi et al. (1995)[50]	Kidney	It was determined that there was no deterioration in family functioning after transplantation.
Soliday et al. (2000)[49]	Kidney	It has also been shown that a suitable family environment can reduce the stress of the child during the transplantation process and prevent additional psychiatric diagnoses.
Kaller et al. (2014)[26]	Liver	It was observed that experiencing great financial difficulties during the transplantation process affected the family's coping process more.
Denny et al. (2012)[49]	Liver	It was observed that changes in family lifestyle decreased the quality of life.
DeBolt et al. (1995)[53]	Liver	In a study conducted with patients 4 years after transplantation, it was reported that the negative impact of the disease on the family system was lower compared to other paediatric chronic disease groups.
Trzepacz et al. (1992)[54]	Liver	It has been shown that social support received before transplantation and high quality of life levels increase survival rates after transplantation.
Ozbaran et al. (2012)[47]	Heart	High anxiety and depressive symptoms were observed in parents of children with VADs.
Yılmaz Kafalı et al. (2021)[48]	Heart	Healthy coping skills of caregivers increase psychiatric adaptation and quality of life of transplant recipient children.
Penner et al (2022)[20]	Kidney, Liver and Heart	It has been observed that the anxiety levels of parents are higher than those experienced by their children.

PTSD: Post-traumatic stress disorder.

immunosuppressive therapies, and social isolation. In parallel, parents face high levels of stress, anxiety, and depression, which can disrupt family dynamics and compromise financial stability.

Therefore, focusing solely on medical outcomes in pediatric organ transplantation is insufficient. Ensuring access to psychosocial support mechanisms is essential for families. Evidence demonstrates that psychiatric evaluations of children and multidisciplinary support approaches positively influence post-transplant adjustment and prognosis. Future research should emphasize the evaluation of psychosocial interventions and the development of improved strategies to promote mental health in pediatric transplant patients.

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