# Quality of Life Before and After Transplantation in Solid Organ Recipients Referred to the North Italy Transplant program (NITp): A Cross-sectional Study

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## ABSTRACT

Introduction. The interest in health-related quality of life (HR-QoL) has increased in the past few years.

Aim. The aim of this study was to evaluate the HR-QoL before and after transplantation in solid organ recipients referred to the North Italy Transplant program.

Material and Methods. This cross-sectional study was performed between 2010 and 2011. All consecutive recipients on the waiting list for liver, heart, or kidney transplantation were included and compared to all consecutive transplanted patients at 6 and 24 months of follow-up after transplantation. The HR-QoL was evaluated with the 36-item Short Form Health Survey (SF–36) and the Profile of Mood States (POMS). Questionnaires were self-reported anonymously. Descriptive statistical analyses were performed.

Results. Four hundred eleven patients were interviewed: 146 patients (35.5%) were on the waiting list, 137 (33.3%) were transplanted 6 months before the interview, and 128 (31.1%) were transplanted 24 months before the interview. Patients on the waiting list had a lower SF–36 score for all items than did transplanted patients after both 6 and 24 months. According to POMS results, patients on the waiting list had a higher prevalence of depression, tension, anger, fatigue, and confusion than did transplanted patients.

Conclusions. Patients on the waiting list showed a worse quality of life compared to patients after transplantation as demonstrated by SF–36 and POMS results. These findings should be confirmed in a cohort study.

SOLID organ transplantation is often the only treatment for patients with end-stage organ failure. It enables recipients to resume many personal and social functions with an enhanced sense of well-being. Health-related quality of life (HR-QoL) is defined as an individual's self-assessment of health that encompasses physical status, mental health, and social well-being. By improving overall health, transplantation provides hope for a better and longer life [1].

The interest in research on HR-QoL and transplantation has increased in past few years. Many studies have been published demonstrating an improvement in HR-QoL in transplanted patients [2–12]. The measurement of HR-QoL has included different general or specific questionnaires, and different aspects related to health and disease control were considered as transplant outcomes. To our knowledge, few studies have been conducted to understand any differences in disease

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0041-1345/19
https://doi.org/10.1016/j.transproceed.2019.02.034

**Table 1. General Characteristics: Sociodemographic Characteristics of Subjects Included in the Survey**

| Category | Variable | Number | % |
|---|---|---|---|
| Sex | Male | 121 | 29.4 |
| | Female | 254 | 61.8 |
| | Missing | 36 | 8.8 |
| Civil status | Married/cohabiting | 301 | 73.2 |
| | Separated/divorced | 29 | 7.1 |
| | Single | 66 | 16.1 |
| | Widow | 10 | 2.4 |
| | Missing | 5 | 1.2 |
| Place of living | North | 338 | 82.2 |
| | South | 58 | 14.1 |
| | Missing | 15 | 3.6 |
| Children | Yes | 287 | 69.8 |
| | No | 106 | 25.8 |
| | Missing | 18 | 4.4 |
| Education | Primary | 77 | 18.7 |
| | Secondary | 281 | 68.4 |
| | University | 41 | 10.0 |
| | Missing | 12 | 2.9 |
| Occupation | Housewife | 45 | 10.9 |
| | Director | 10 | 2.4 |
| | Administrative worker | 48 | 11.7 |
| | Freelance | 46 | 11.2 |
| | Factory worker | 39 | 9.5 |
| | Retired | 153 | 37.2 |
| | Student | 3 | 0.7 |
| | Other | 47 | 11.4 |
| | Missing | 20 | 4.9 |
| Subject category | On waiting list | 146 | 35.5 |
| | 6 months after transplantation | 137 | 33.3 |
| | 24 months after transplantation | 128 | 31.1 |
| Solid organ | Kidney | 172 | 41.8 |
| | Heart | 119 | 29.0 |
| | Liver | 120 | 29.2 |

burden or psychological aspects of health in patients on the waiting list for the transplantation of different solid organs [8–12]. With this background, we performed a cross-sectional multicentric study enrolling different solid organ recipients referred to the North Italy Transplant program. We evaluated the HR-QoL in these solid organ transplant recipients before and after different solid organ transplantation.

## MATERIALS AND METHODS

### Patients and Study Design

This is a cross-sectional study performed between 2010 and 2011. Three groups of consecutive patients referred to the North Italy Transplant program were investigated and compared regarding HR-QoL: all consecutive patients on the waiting list for liver, kidney, or heart transplantation; all consecutive patients with 6 months of follow-up after transplantation; and all consecutive patients with 24 months of follow-up after transplantation. Sociodemographic characteristics were collected. The study was approved by the hospital institutional review board. All patients provided written informed consent to participate in the study.

### Questionnaires

The HR-QoL was evaluated with 2 different questionnaires, the 36-item Short Form Health Survey (SF–36) and the Profile of Mood States (POMS) [13–16]. The Italian version of each questionnaires was administered during the ambulatory visits, and patients self-reported anonymously [13,16].

The SF–36 questionnaire, developed by the Boston Health Research Institute in the United States, provides a direct quantitative indication of an individual's health status. It provides a concise method for checking the health status of members of the general population aged >14 years [13,14].

The POMS is a well-established, factor-based, and analytically derived measure of psychological distress. The POMS measures 6 mood states: tension-anxiety, depression-dejection, anger-hostility, vigor, fatigue, and confusion. Furthermore, the POMS may be used as instrument for the diagnosis of anxiety, depression, fatigue, confusion, and vigor, according to a specific cut-off [15,16].

### Statistical Analysis

Categorical variables were expressed as frequency and percentage values and compared by the $\chi^2$ test; continuous variables were expressed as mean and range. Continuous variables were tested for normal distribution using the Shapiro-Wilk test and compared using the 2-tailed Student $t$ test and the Kruskal-Wallis test where appropriate. A $P$ value of $<.05$ was considered statistically significant.

Risk factors for POMS variables were estimated by calculating unadjusted and adjusted odds ratios (ORs) and 95% confidence intervals (CI) using logistic regression. As no difference was observed between the 2 groups of transplanted patients according to POMS results, we considered them as a unique group when evaluating whether transplantation may be considered a predictor of any mood states.

Statistical analyses were performed with SAS software, version 9.0 (SAS Institute Inc, Cary, NC, United States).

## RESULTS

### General Characteristics

Four hundred eleven patients were included in this study and interviewed. Two hundred fifty-four patients (61.8%) were female. One hundred forty-six patients (35.5%) were on the waiting list. Of these, 76 (52%), 45 (31%), and 25 (17%) were waiting for kidney, liver, and heart transplantation, respectively. Two hundred sixty-five patients (64.4%) were included after transplantation. Of these, 96 (36%) had undergone kidney transplantation, 94 (36%) heart transplantation, and 75 (28%) liver transplantation. One hundred thirty-seven patients (33.3%) were included after 6 months and 128 (31.1%) after 24 months from transplantation. Sociodemographic characteristics are reported in Table 1.

**Table 2. SF–36 Scoring Results for Each Item in Subjects on the Waiting List, Those With 6 Months of Follow-up, and Those With 24 Months of Follow-up**

| Variable | Group | n | Mean | Standard Deviation | Median | min-max | *P* value |
|---|---|---|---|---|---|---|---|
| Physical functioning | Waiting list | 146 | 66.6 | 26.4 | 70 | 0–100 | .0001 |
| | 6 months | 136 | 78.1 | 22.3 | 85 | 0–100 | |
| | 24 months | 127 | 81.1 | 20.5 | 85 | 5–100 | |
| Physical role functioning | Waiting list | 143 | 44.2 | 42.2 | 25 | 0–100 | .0002 |
| | 6 months | 133 | 54.3 | 39.9 | 50 | 0–100 | |
| | 24 months | 128 | 65.2 | 38.3 | 75 | 0–100 | |
| Bodily pain | Waiting list | 144 | 67.3 | 26.1 | 70 | 2–100 | .002 |
| | 6 months | 134 | 75.1 | 25.3 | 82 | 0–100 | |
| | 24 months | 128 | 77.2 | 25.9 | 84 | 12–100 | |
| Vitality | Waiting list | 144 | 57.1 | 22.2 | 55 | 10–100 | .0001 |
| | 6 months | 136 | 71.3 | 17.1 | 75 | 25–100 | |
| | 24 months | 128 | 68.1 | 21.6 | 70 | 0–100 | |
| Social role | Waiting list | 141 | 73.6 | 24.7 | 75 | 0–100 | .1778 |
| | 6 months | 135 | 77.6 | 21.7 | 87 | 12–100 | |
| | 24 months | 128 | 79.1 | 22.1 | 87 | 12–100 | |
| Emotional role | Waiting list | 143 | 64.1 | 41.9 | 100 | 0–100 | .09 |
| | 6 months | 134 | 70.4 | 37.4 | 100 | 0–100 | |
| | 24 months | 128 | 74.5 | 37.8 | 100 | 0–100 | |
| Mental health | Waiting list | 145 | 70.1 | 19.2 | 75 | 12–100 | .0003 |
| | 6 months | 136 | 79.1 | 15.4 | 84 | 36–100 | |
| | 24 months | 128 | 74.7 | 19.7 | 80 | 12–100 | |
| General health | Waiting list | 146 | 43.5 | 21.9 | 40 | 5–100 | .0001 |
| | 6 months | 136 | 67.0 | 19.8 | 67 | 15–100 | |
| | 24 months | 128 | 63.0 | 19.2 | 67 | 15–95 | |

Abbreviation: SF–36, 36-item Short Form Health Survey.

### SF–36 Results

Patients on the waiting list had lower SF–36 scores for all items than did transplanted patients after both 6 and 24 months. Statistically significant differences were observed for the majority of the investigated items: physical functioning ($P = .0002$), physical role functioning ($P < .0001$), bodily pain ($P = .002$), vitality ($P < .0001$), mental health ($P = .0003$), and general health perception ($P < .0001$) (Table 2). No differences were found between the scores of patients 6 and 24 months following transplantation.

Among patients on the waiting list, significant differences were observed according to which solid organ was to be transplanted. In particular, subjects waiting for heart transplantation had lower SF–36 scoring than did subjects waiting for kidney or liver transplantation.

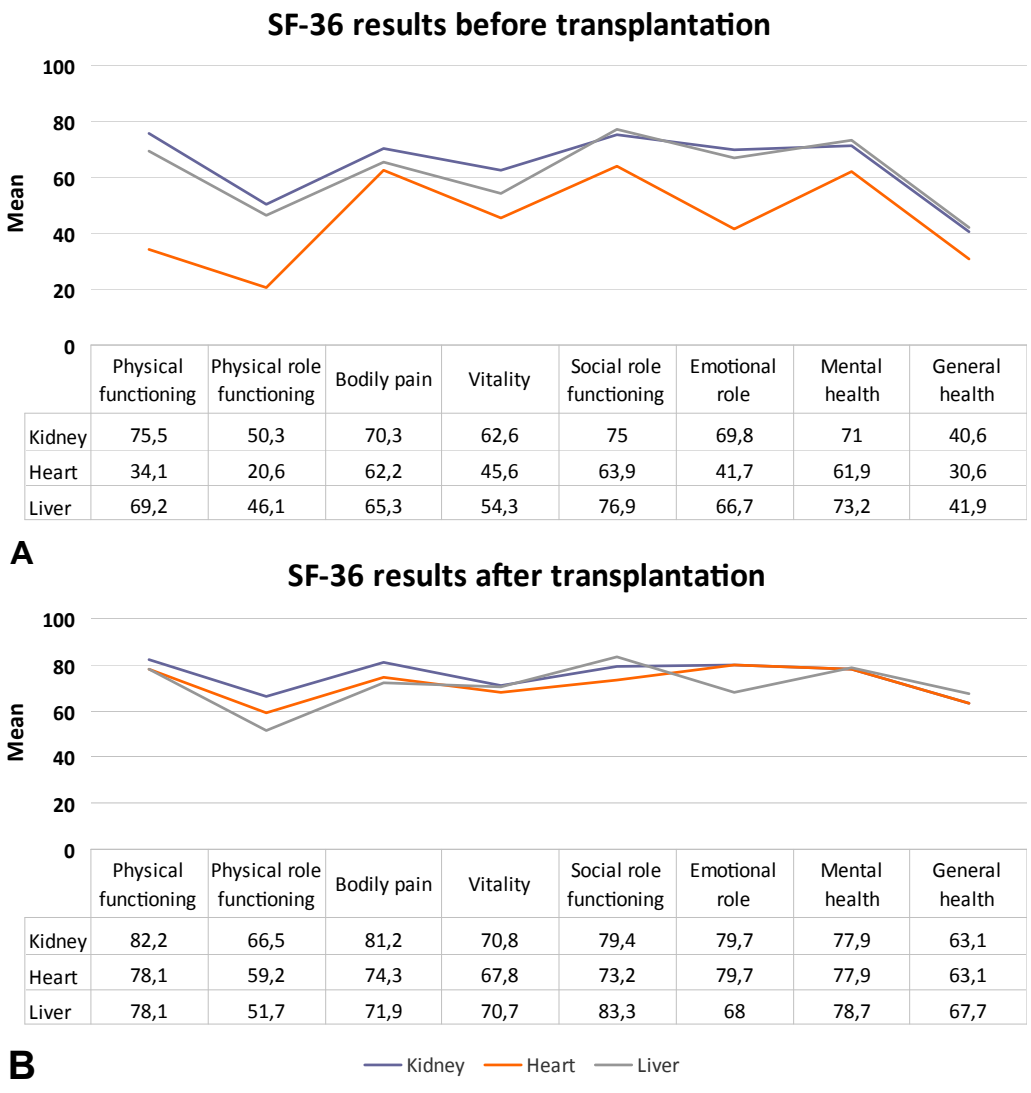
Statistical differences were found for physical functioning ($P < .0001$), physical role functioning ($P = .0085$), general health perception ($P = .0007$), vitality ($P = .0025$), emotional role functioning ($P = .0214$), and mental health ($P = .0395$) (Fig 1A). After transplantation, those differences tended to disappear. However, liver-transplanted patients had a lower score for bodily pain ($P = .0450$) and a higher social role functioning than did patients on the waiting list ($P = .020$) (Fig 1B).

### POMS Results

Higher scores in tension or anxiety ($P = .1378$), depression or dejection ($P < .05$), anger or hostility ($P= .021$), fatigue or inertia ($P < .05$), and confusion or bewilderment ($P = .0472$) were observed in patients on the waiting list as compared to those already transplanted. On the contrary, those on the waiting list had a lower score in vigor or activity ($P < .05$) as compared to those transplanted (Table 3).

Patients waiting for heart transplantation had a worse score compared to those waiting for kidney or liver transplantation, but statistical differences were found only for vigor or activity ($P = .0068$) and fatigue or inertia ($P = .0180$) (Fig 2A). After transplantation, worse results were found in kidney recipients, with a statistical difference in tension or anxiety ($P = .0455$), anger or hostility ($P = .0036$), and vigor or activity ($P = .0189$) (Fig 2B).

Patients on the waiting list had a 2-fold higher risk of depression (OR 2.02, CI 95 1.28–3.19) and of fatigue (OR 2.30, CI 95 1.49–3.56). Furthermore, patients on the waiting list had a 2.4-fold higher risk of not being vital (OR 2.37, CI 95 1.56-3.61) (Table 4). After adjustments for age, sex, organ to be transplanted, civil status, education, and employment, the results did not change. Following this adjustment, patients on the waiting list had a higher risk of depression (OR 3.01, CI 95 1.72–5.27), of fatigue (OR 2.90,




| | Physical functioning | Physical role functioning | Bodily pain | Vitality | Social role functioning | Emotional role | Mental health | General health |
|---|---|---|---|---|---|---|---|---|
| Kidney | 75,5 | 50,3 | 70,3 | 62,6 | 75 | 69,8 | 71 | 40,6 |
| Heart | 34,1 | 20,6 | 62,2 | 45,6 | 63,9 | 41,7 | 61,9 | 30,6 |
| Liver | 69,2 | 46,1 | 65,3 | 54,3 | 76,9 | 66,7 | 73,2 | 41,9 |

| | Physical functioning | Physical role functioning | Bodily pain | Vitality | Social role functioning | Emotional role | Mental health | General health |
|---|---|---|---|---|---|---|---|---|
| Kidney | 82,2 | 66,5 | 81,2 | 70,8 | 79,4 | 79,7 | 77,9 | 63,1 |
| Heart | 78,1 | 59,2 | 74,3 | 67,8 | 73,2 | 79,7 | 77,9 | 63,1 |
| Liver | 78,1 | 51,7 | 71,9 | 70,7 | 83,3 | 68 | 78,7 | 67,7 |

**Fig 1.** Comparative analysis of the results of the SF-36 survey in relation to the solid organ. Means were reported in Table 2, and *P* values were reported in the text when differences were statistically significant. **(A)** Data before transplantation. **(B)** Data after transplantation. SF-36, 36-item Short Form Health Survey.

CI 95 1.69–4.98), and of not being vital (OR 2.58, CI 95 1.54–4.31) as compared to transplanted subjects.

## DISCUSSION

In this cross-sectional study, SF–36 and POMS results showed that patients on the waiting list for transplantation had a worse quality of life and a higher prevalence of negative mood states than did transplanted patients. As expected, both physical and mental components presented a lower score before transplantation than after transplantation. Among those on the waiting list, patients waiting for heart transplantation had the worst quality of life scoring compared to patients waiting for liver or kidney transplantation, and the differences tended to disappear after transplantation.

Differences among patients waiting for transplantation of a different solid organ may be explained by pretransplant factors, such as the severity and duration of the disease, and subjective psychological characteristics, such as personality and depression. Among heart recipients, scoring was significantly lower in patients on the waiting list compared to those transplanted. This trend was also observed in liver and kidney recipients, but these results were not significant. Furthermore after transplantation, differences according to the different solid organ tended to be minimized and/or

**Table 3. POMS Scoring Results for Each Item in Subjects on the Waiting List, Those With 6 Months of Follow-up, and Those With 24 Months of Follow-up**

| Variable | Group | n | Mean | Standard Deviation | Median | min-max | *P* value |
|---|---|---|---|---|---|---|---|
| Tension or anxiety | Waiting list | 143 | 9.2 | 6.4 | 8 | 0–29 | .1378 |
| | 6 months | 136 | 7.6 | 5.5 | 7 | 0–27 | |
| | 24 months | 126 | 9.1 | 6.9 | 7 | 0–29 | |
| Depression or dejection | Waiting list | 143 | 7.8 | 8.3 | 6 | 0–37 | < .05 |
| | 6 months | 136 | 4.3 | 6.9 | 2 | 0–43 | |
| | 24 months | 126 | 6.8 | 8.9 | 3 | 0–44 | |
| Anger or hostility | Waiting list | 143 | 8.3 | 7.9 | 6 | 0–36 | .0213 |
| | 6 months | 136 | 6.1 | 6.8 | 4 | 0–29 | |
| | 24 months | 126 | 7.7 | 8.2 | 5 | 0–38 | |
| Vigor or activity | Waiting list | 143 | 15.2 | 7.3 | 15 | 0–32 | < .05 |
| | 6 months | 136 | 18.8 | 5.9 | 19 | 2–32 | |
| | 24 months | 126 | 17.6 | 6.4 | 18 | 1–31 | |
| Fatigue or inertia | Waiting list | 143 | 6.4 | 4.7 | 6 | 0–21 | < .05 |
| | 6 months | 136 | 4.5 | 4.3 | 3 | 0–23 | |
| | 24 months | 126 | 5.5 | 5.2 | 4 | 0–25 | |
| Confusion or bewilderment | Waiting list | 143 | 6.5 | 4.4 | 6 | 0–20 | .0472 |
| | 6 months | 136 | 5.4 | 4.2 | 4 | 0–22 | |
| | 24 months | 126 | 6.4 | 4.9 | 6 | 0–24 | |

Abbreviation: POMS, Profile of Mood States.

reverted when data from both in SF–36 and POMS surveys were used. Although some of those reverted differences were statistically significant, those results may be considered without any clinical impact.

The interest in quality of life has increased in past few years, as shown by several studies reported in literature [2–12]. Overall, all these reports showed an improvement in HR-QoL after transplantation in different scenarios. In some studies, only subjects after transplantation were evaluated and compared to a standard population [4,8,9]. Some of the studies were performed in very select populations [2,5], some only in pediatric populations ([3,6,7], some only in recipients waiting for a specific solid organ [2–7]. Other studies compared patients on the waiting list for liver, kidney, or heart transplantation [8–12]. In particular, a previous cohort study published in 2008 compared patients on different organ waiting lists before and after solid organ and bone marrow transplantation [11]. Due to the high number of drop-outs and deaths, the number of patients completing the different time points was smaller than in our study. This limitation of study design was overcome in our study by the cross-sectional design. A previous report [10] demonstrated that thoracic organ (lung) recipients had the worst scoring, with a clear improvement after transplantation. Those results were confirmed in our study in heart recipients. In all these previous studies, the research tools were different, and general or specific questionnaires (including selected disease entities and assessment of related disorders) were administered. In our study, we preferred using general and standardized questionnaires [13–16], first to have an instrument applicable to all recipients and second to improve the reliability and validity of the study.

To our knowledge, ours is one of the larger studies that compares patients waiting for the transplantation of different solid organs to shed light on any differences in disease burden and psychological aspects of patients in these groups [10–12]. Some limitations need to be addressed. The first relates to the cross-sectional design. An observational study should require a higher number of enrolled subjects to minimize the effect of potential loss of follow-up or death of subjects. The use of a cross-sectional study design did allow us to easily reach a statistical power. Another limitation is that by enrolling only patients who survived to the 6th and 24th month of follow-up, we were selecting only those in better condition. This may introduce a selection bias that may be translated in an overestimation of the difference between patients before and after transplantation.

Even though the effects reported in the different studies are not always comparable due to differences in methodology, series, and detection system, the results have associated transplantation with a better quality of life concerning emotional, physical, and mental health. Our analysis confirmed that patients in need of a heart or a liver have more physical limitations than do renal patients, who can benefit from dialysis treatment. For the majority of patients, quality of life improves after transplantation for the physical aspects with a fall-out on the emotional aspects.

## CONCLUSIONS

Patients waiting for heart transplantation had worse HR-QoL compared to those waiting for kidney and liver transplant. Patients waiting for organ transplantation had a lower scoring in HR-QoL compared to patients 6 and 24 months after transplantation and to the general population. Our results allowed us to identify factors that could be

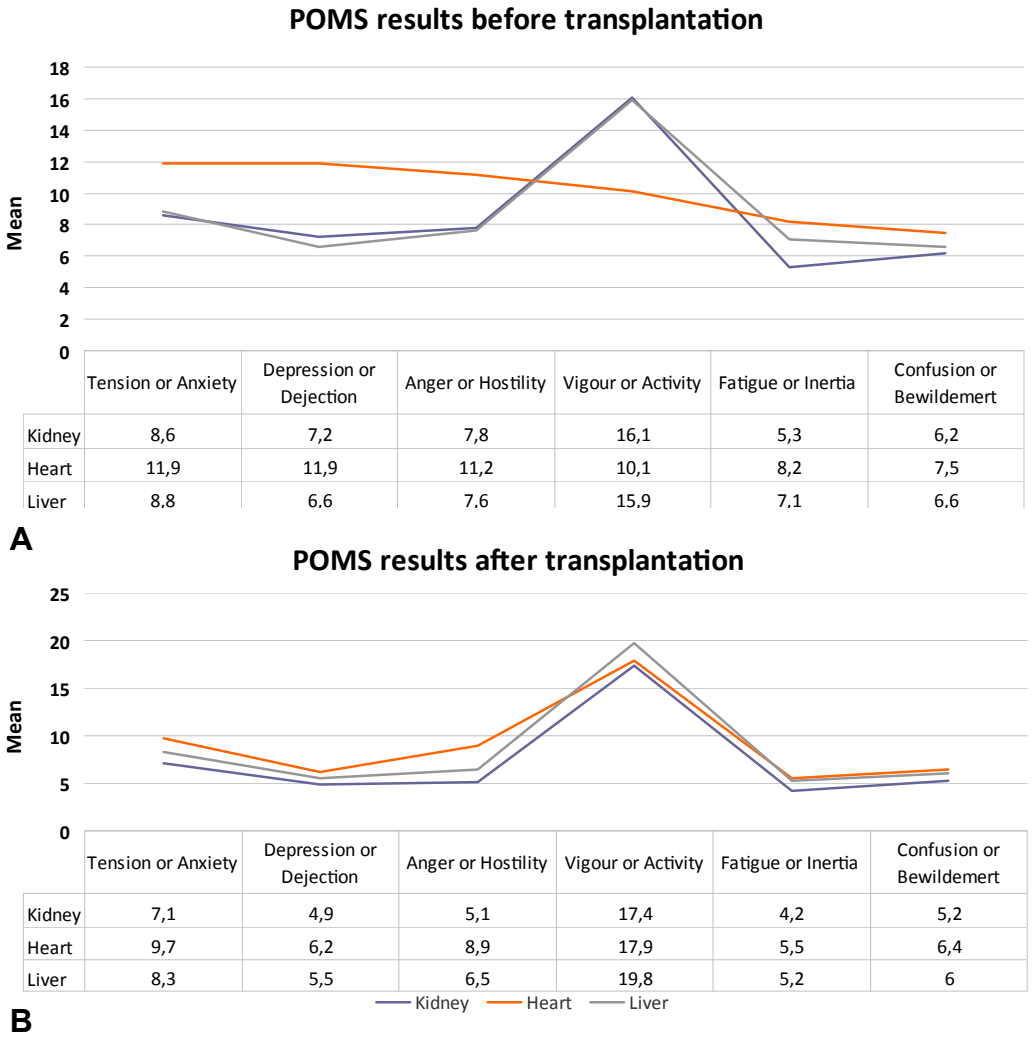



**Fig 2.** Comparative analysis of the results of the POMS survey in relation to the solid organ. Means were reported in Table 3, and *P* values were reported in the text when differences were statistically significant. **(A)** Data before transplantation. **(B)** Data after transplantation. POMS, Profile of Mood States.

improved to reduce social difficulties, anxiety, and depression. These results should be confirmed in a cohort study to assess for the first time any real improvements in HR-QoL after transplantation.

**Table 4. Risk of Mood State: Odds Ratio for the Presence of POMS Variable in Patients on the Waiting List Compared to Those Who Underwent Transplantation***

| Variable | Odds Ratio | 95% Confidence Interval |
|---|---|---|
| Tension or anxiety | 1.40 | 0.92–2.15 |
| Depression or dejection | 2.02 | 1.28–3.19 |
| Anger or hostility | 1.46 | 0.96–2.21 |
| Absence of vigor or activity | 2.37 | 1.56–3.61 |
| Fatigue or inertia | 2.30 | 1.49–3.56 |
| Confusion or bewilderment | 1.26 | 0.78–2.02 |

Abbreviation: POMS, Profile of Mood States.
*Subjects with 6 months and 24 months of follow-up were considered a unique category.

## ACKNOWLEDGMENTS

We thank transplant centers of the North Italy Transplant program for patient recruitment. A special thank you to the Research Institute Mario Negri, Milan, and to organ donor families.

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