

Causal Relationships Among Depression and Quality of Life: A Cross-Lagged Analysis

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The three wave longitudinal study was carried out across 15 months to clarify if perceived quality of life (QoL) and depression levels are distinct constructs to measure or if depression is an aspect of overall QoL. The sample comprised of renal transplant recipients on regular follow-up in renal units of Lahore, Pakistan. The mean age of recipients was 33.33 years (age ranging from 18 to 54 years). These recipients had a post-transplant time ranging from 6 months to 10 years ($M = 2.8$, $SD = 1.5$) and with normal graft functioning. QoL was assessed using Quality of Life Index-Kidney Transplant Version (Ferrans & Powers, 1985) and depression was measured by Beck Depression Inventory-II (Beck, Steer, & Brown, 1996). The findings revealed a significant negative correlation between depression and perceived QoL, suggesting that recipients with increased depression levels reported less satisfaction with their QoL and vice versa. A linear regression showed that both depression and QoL significantly predicted each other. Further, a cross-lagged correlation analysis to clarify the causal direction of this relationship showed no clear causal direction indicative of an overlap among these constructs, hence, suggesting a lack of distinctiveness as separate constructs. The findings raised a question if depression and QoL are distinct constructs or depression may be considered as an aspect of overall QoL. A lack of causal direction implicates that both depression and perceptions of QoL are subjective constructs which need to be examined for their impact and clarified directional relationships.

Keywords: Depression, quality of life, renal transplant recipients (RTRs), longitudinal study, cross-lagged correlation (CLC)

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Quality of Life (QoL) in health outcomes is assessed considering the satisfaction of patients with their physical functioning and psychological well-being reflecting the efficacy of an intervention (Akman, Ozdemir, Sezer, Micozkadioglu, & Haberal, 2003). Transplantation is a physical experience that affects the recipients' health status and psychological well-being. Studies aim to investigate the psychosocial health of transplant recipients to evaluate QoL (Goetzmann et al., 2012). Renal transplants are the most commonly performed transplants with high survival rates (Theofilou, 2012). Physical and perceived health status improves significantly after successful renal transplant as compared to dialysis (Dukes, Seelam, Lentine, Schnitzler, & Neri, 2013). Although, the advantages of renal transplantation are well established, QoL differs largely among specific transplant cohort (Fujisawa et al., 2000). Despite of similar health status, there are differences in satisfaction and perceptions of QoL among recipients that is attributed to a variety of psychosocial factors. Studies attempt to examine if illness perceptions are related to disease severity, QoL, and psychological adjustment. By raising and addressing these issues, clinicians may be able to address these significant and often unexpressed concerns and improve QoL (Rochelle & Fidler, 2013).

It is found that a poorer QoL is associated with a combination of clinical and socio-demographic factors including female gender, unemployment, lower education, living alone, high Body Mass Index, diabetes, recent critical illness, hospitalization, noncompliance, a long duration of dialysis, and treatment side effects (Gentile et al., 2013). Morbidity is found to be a mediator between functional disability and QoL. In a study, it was found that emotional representations, depression, and anxiety are significant mediators of QoL. To identify high-risk patients, it is important to consider the mediating factors among treatment consequences and QoL (Calman, 1984). Psychological states such as anxiety and depression are also linked with poorer QoL and considered as independent predictors of QoL among clinical population (Fallon, Gould, & Wainwright, 1997).

The important aspect of life post-transplant is the way recipients accept, adapt, and cope with the altered life styles. A prospective study examined the effect of maladaptive coping strategies and psychological QoL on depression and found that engaging in various kinds of avoidant behaviors was significantly associated with greater depression. QoL was found to be the single most important predictor of depression. The authors suggested that future studies need to focus on improving QoL and increasing adaptive coping strategies (Gore-Felton et al., 2006). Although, recipients' social functioning

and emotional well-being improves after renal transplantation (Tanriverdia et al., 2004), however, they may develop emotional distress and affective disorders, such as anxiety and depression, associated with a compromised QoL (Pacazio et al., 2010).

Symptoms of depression and anxiety as well as personality trait of emotional stability have independent significant effect on the health-related QoL (Goetzmann et al., 2008). Depression is considered as a high risk for kidney failure, return to dialysis, and death. Therefore, screening for depression is essential to evaluate and monitor the occurrence of depression and identify high-risk recipients after transplant (Dobbels et al., 2008). A study compared depressive symptoms between renal transplant recipients (RTRs) and end stage renal disease (ESRD) patients on dialysis, identifying the correlates of depressive symptoms in the transplant recipients and found that the prevalence of depression was lower in transplant recipients. However, they further found that one-fifth of RTRs were still at high risk of clinically significant depression (Szeifert et al., 2009). Depressive symptoms are an independent predictor of mortality in RTRs (Novak et al., 2010). Depression lowers QoL and recipients reporting depression are older with poor graft function. The findings suggest that besides investigating clinical factors, there is need to explore the socio-demographic variables that may cause, precipitate or potentiate the occurrence and prevalence of depression.

Screening recipients for depression can improve psychological well-being and increase QoL satisfaction (Kusleikaite, Bumblyte, & Pakalnyte, 2007). The strong link between depression and QoL is reviewed by de Leval's model (de Leval, 1995, 1999) suggesting that changes in cognitions about one's past, present, and future QoL are associated with changes in depressive symptomatology. Judgments concerning both, implicitly or explicitly, involve a time perspective. In contrast to de Leval's model of perceived QoL influencing consequent mood, some studies report that depressed recipients tend to be less satisfied with their QoL (Szeifert et al., 2009). de Leval's theoretical model was tested for linking depression and QoL with a time perspective and reported that people use their current affective state as a basis for making judgments of how happy and satisfied they are with their lives; and that depression influenced individual's QoL by lowering the person's objective QoL. Thus, depression was associated with a larger gap between current perceptions of reality and patient's aspirations and realistic expectations. However, patients' appraisal of their present QoL improved with successful treatment of depression, reflected by a closure of the present-preference gap (Moore, Hofer, McGee, & Ring, 2005). The important thing is to

consider the reasons and factors that bring about these changes in the cognitions about past, present, and future. What actually makes individuals perceive their life in a certain manner is worth clarifying. Affective responses such as depression are a consequence of these cognitions.

It is observed that interpersonal processes, specifically, family expectations; social support and negative support; and psychological adjustment as measured by depression, optimism, and QoL play a significant role in coping (Testa & Simonson, 1996). Studies emphasize that although physical health status predicts long-term mortality and graft failure independently of socio-demographic and clinical risk factors in RTRs, but psychological issues need to be addressed. In particular, health locus of control is considered to be a determinant of psychological states such as depression. People can attribute the source of control of events that involve them either to internal or external factors. Through this view, depression can be defined as a belief that one's own behavior is not effective. There is evidence of a positive correlation between external locus orientation and depression and QoL scores, and negative correlation between internal orientation and depression (Moore et al., 2005). Future research in health outcomes should identify the determinants of subjective QoL and refine interventions to improve it (Szeifert et al., 2009).

Rationale of the Study

This longitudinal study was mainly conducted to investigate the perceptions of QoL after a successful renal transplant to assess efficacy of transplantation in a developing country like Pakistan. Secondly, so far, no research has focused on the psychosocial aspects of transplantation in Pakistan where renal transplants are done at an increased and alarming rate. Depression is one of the major psychological factors that is considered as a high risk for the healthy functioning of the transplanted kidney as well as psychological well-being of the recipient. Therefore, perceived QoL was evaluated among recipients along with depression levels to explore if depression reduces QoL satisfaction or recipients with a poorer perception of QoL tend to be depressed. The study investigates the casual direction of this relationship over a period of 15 months, so that the research can assess changes and transitions in perceived QoL and depression over time. The purpose was to see how each construct influences the other with the passage of time.

Research Questions

1. How do most recipients perceive their QoL after a successful renal transplant?
2. Is there a relationship between depression and QoL satisfaction?
3. Does depression predict QoL satisfaction among RTRs or vice versa?

Method

Study Design

A longitudinal prospective cohort study was carried out investigating demographic differences in conscientiousness and how it affects perceptions of QoL among RTRs recruited from renal clinics in Lahore, Pakistan. A descriptive design was used to examine QoL over a period of 15 months.

Participants and Recruitment

The sample size varied due to drop outs in all three points of assessment i.e., Wave 1 ($N = 150$), Wave 2 ($N = 147$), and Wave 3 ($N = 144$). The mean age of recipients was 33.33 years (ranging from 18 to 54 years). These recipients had a post-transplant time ranging from 6 months to 10 years ($M = 2.8$, $SD = 1.5$) and with normal graft functioning. The study got a favorable ethical opinion from University of Surrey, United Kingdom, ethics' committee.

Inclusion criteria. RTRs currently on a schedule of regular follow-up appointments; age 18 years onwards without any co-morbidity (existing physical or mental disorders); not more than one previous transplant; minimum basic formal schooling of equivalent primary school level; and healthy graft functioning as indicated by follow up monitoring of renal function tests.

Exclusion criteria. RTRs with medical co-morbidities or complications and/or psychological disorders; below the age of 18 years; illiterate recipients with no formal schooling; more than two kidney transplants in total, or any other co-existing transplant e.g., liver, heart, or lung transplant along with a kidney transplant.

Table 1 presents description along socio-demographic aspects of the RTRs. Those who are married or engaged are categorized as 'in a relationship'; and those who are never married, divorced, separated,

and widowed are categorized as 'single' due to a low representation of each category.

Table 1

Demographic Characteristics of the RTRs

Demographics	Wave 1	Wave 2	Wave 3
	(N = 150) n(%)	(N = 147) n(%)	(N = 144) n(%)
Gender			
Men	99(66.0)	100(66.7)	94(64.0)
Women	48(32.0)	49(32.7)	47(32.0)
Marital Status			
In a relationship	69(46.0)	80(53.3)	77(51.3)
Single	75(50.0)	67(44.7)	67(44.7)
Education Level			
School level only	35(24.3)	35(24.3)	35(23.8)
Graduate	43(29.9)	43(29.9)	43(29.3)
Post-graduate	66(45.8)	68(45.8)	69(46.9)
Work Status			
Employed	92(64.3)	94(64.3)	95(64.6)
Unemployed	51(35.7)	52(35.7)	52(35.4)
Home Location			
Rural	84(58.7)	86(58.7)	87(59.2)
Urban	59(41.3)	60(41.3)	60(40.8)
Family System			
Joint	37(25.2)	35(23.8)	110(74.0)
Nuclear	110(74.8)	108(73.5)	37(25.2)
Monthly Income			
< Rs*35k	8(5.6)	8(5.6)	8(5.4)
Rs.36-50k	78(54.2)	78(54.2)	78(53.1)
Above Rs.50k	58(40.3)	60(40.3)	61(41.5)

Measures

The measures included a demographic sheet requiring information based on age, gender, marital status, years of formal education, employment status, household income, number of dependents, familial background (rural/urban), and family systems (joint or nuclear). Housewives and students were included in the unemployed category. Medical information collected included basic clinical information about approximate onset and duration of ESRD; dialysis modality (hemodialysis, peritoneal, or both) before transplant and duration of dialysis; primary and secondary nephrologic diagnosis to reveal the etiology of renal failure; time since transplant; current

medication (immunosuppressant group and dosage); complete blood profile with renal functions (including, serum creatinine, blood urea, uric acid). Other measures were:

Quality of Life Index (QoL Index) Kidney Transplant Version III. The QoL Index developed by Ferrans and Powers (1985) consists of 35 items and measures both satisfaction and importance of various aspects of life. Importance ratings are used to weight the satisfaction responses, so that scores reflect the respondents' satisfaction with the aspects of life they value. The instrument consists of two parts: The first measures satisfaction with various aspects of life and the second measures their importance. Scores are calculated for overall QoL and four domains including Health and Functioning, Psychological/ Spiritual, Social and Economic, and Family. Items that are rated as more important have a greater impact on scores than those of lesser importance. Satisfaction is rated from 1 = *very dissatisfied* to 6 = *very satisfied*, and importance is rated from 1 = *very unimportant* to 6 = *very important*. Scores are calculated by weighting each satisfaction response with its paired importance response (Ferrans, 1990, 1996; Ferrans & Powers, 1992, 2008). In previous studies, internal consistency for the QoL Index (total scale) was supported by Cronbach alphas ranging from .73 to .99 (Ferrans & Powers, 1992).

Beck Depression Inventory-II (BDI-II). The Beck Depression Inventory (Beck, Steer, & Brown, 1996) BDI, is a 21-question multiple-choice self-report inventory, one of the most widely used instruments for measuring the severity of depression. The scores can be related to role limitations due to emotional problems. Each item is responded to on a scale from 0 to 3, where 0 is for a statement describing minimum feeling regarding an aspect of depression and a score of 3 reflects severe depression. The responses on each dimension are summed and a total score is obtained. This total score is compared with the given cut off scores. The cut-offs used are 0-13 for minimal depression, 14-19 for mild depression, 20-28 for moderate depression, and 29-63 for severe depression. Higher total scores indicate more severe depressive symptoms. Participants are asked to rate how they have been feeling for the past two weeks. The BDI-II is positively correlated with the Hamilton Depression Rating Scale with a Pearson $r = .71$, showing good agreement. The test was also shown to have a high one-week test-retest reliability (Pearson $r = .93$), suggesting that it was not overly sensitive to daily variations in mood. The test also has high ($\alpha = .91$) internal consistency (Beck et al., 1996). Anxiety, depression, and emotional profiles of RTRs ($n = 42$, $M_{\text{age}} = 45.64$, $SD = 8.36$) and healthy controls ($n = 42$, $M_{\text{age}} = 46.96$,

$SD = 10.38$) were compared. However, nonsignificant difference were found in depression scores evaluated by BDI-II, RTRs $M = 5.32$ vs. Controls (healthy subjects) $M = 6.58$, $p = .05$ (Pacazio et al., 2010).

Procedure

This three-wave longitudinal study investigating the causal relationship between depression and perceived QoL among RTRs was conducted over a period of 15 months. Three assessments comprised of an initial baseline evaluation (Wave 1) followed by Wave 2 assessment with an interval of 6 months. Finally, Wave 3 assessments were conducted with a gap of one year following Wave 2 assessment. The recipients were approached and recruited as referrals from physicians in renal out-patient units of private and government hospitals in Lahore (Pakistan). The assessments were conducted during their follow up sessions at the clinic individually. The study got a favorable ethical opinion from the University of Surrey ethics committee, fulfilling the ethical considerations.

Results

The results across all three waves indicated that most recipients are satisfied with their QoL and reported minimum to mild level of depression after renal transplant indicative of their subjective well-being.

Table 2

Descriptive Statistics and Correlations for QoL and BDI- II at Wave 1, 2, and 3

Assessment	N	Range		BDI-II		
		Min – Max	M(SD)	Wave 1	Wave 2	Wave 3
QoL						
Wave 1	150	12.08 - 35.00	23.71(3.45)	-.70**	-.24**	-.38**
Wave 2	147	16.41 - 29.35	23.74(2.62)	-	-.53**	-.29**
Wave 3	144	17.50 - 29.31	24.98(2.35)	-	-	-.54**
BDI-II						
Wave 1	150	2.00 - 32.00	10.84(5.58)	-	-	-
Wave 2	147	3.00 - 27.00	11.90 (5.19)	-	-	-
Wave 3	144	3.00 - 19.00	9.50(4.00)	-	-	-

** $p < .001$.

A significant negative correlation among QoL and depression is found at all three waves consistently (see Table 2). The negative correlations among depression and QoL indicate that recipients who are less satisfied with their QoL tend to be more depressed or vice versa. A correlation of .70 at Wave 1 seems very close to the theoretically attenuated maximum. The attenuated correlation between QoL index and BDI II is .80. This means that QoL and depression are very highly correlated with each other at any one time point, suggesting a strong overlap in these constructs. Since depression does not appear to cause QoL or vice versa, it is more evidence suggesting that QoL and depression could be aspects of the same thing rather than separate constructs. Therefore, it cannot be said whether a less satisfied QoL is causing depression or it's depression that lowers their QoL satisfaction.

The findings (Table 2) suggest that depression and QoL are reciprocally related and here it is seen whether depression is more strongly implicated in causing QoL than QoL is in causing depression. The purpose to carry out cross-lagged analysis is to clarify whether being depressed makes the recipients to become dissatisfied with their QoL or is it that being dissatisfied with their life tends to make them depressed in the period after a transplant.

It is not a surprise that the results showed that there are significant associations found between recipients' depression levels and their subjective QoL. Significant negative correlations were found between depression and QoL, suggesting that the lower the level of depression higher is satisfaction with QoL.

Path Analysis

Path analysis was used to investigate causal relationships between depression and QoL after a renal transplant. Longitudinal data from participants ($N = 144$) over a period of 15 months was used to model lagged and cross-lagged paths over three wave points of assessment after transplant, with a baseline (Wave 1) followed by an interval of six months (Wave 2) and one year (Wave 3). Causal relationships might be inferred using cross-lagged designs in which variables are measured at least twice over time (Kenny, 1975; Marmor & Montemayor, 1977). In order to compare the correlations between one set of variables with that between a second overlapping set of variables in a longitudinal data comprising the same set of participants, a cross-lagged panel correlation analysis is used (Rogosa, 1980). This design involves analysis of reciprocal relationships between two or more variables that are measured at each of the points

in time. Applying it to the present study, the comparison is made by analyzing the correlation between QoL at Wave 1 and depression measured at Wave 2; versus depression measured at Wave 1 and QoL at Wave 2 controlling for the autocorrelations between variables and the correlations between QoL and depression at each wave point. There are three points of assessment, so it also involves correlations between QoL Wave 2 and depression Wave 3 and vice versa as well. The aim is to estimate and test the strength of the relationship between the two sets of variables and determine causal priority using Steiger's formula (1980), to compare nonoverlapping variables.

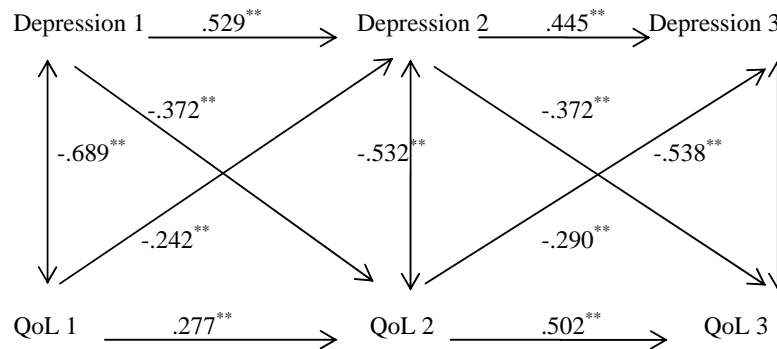


Figure 1. Cross-lagged correlation analysis of depression and QoL. ** $p < .001$. List wise $N = 144$

The cross-lagged correlations among QoL and depression at Wave 1 and 2 indicate that the two sets of correlations did not differ ($z = -0.20$, $p = .83$). Similarly, a nonsignificant difference was found between these dependent correlations among QoL and depression at Wave 2 and 3 ($z = 1.91$, $p = .05$), suggesting that no causal priority can be determined between depression or QoL over time. It cannot be established whether being depressed makes people less satisfied with their QoL or vice versa. It is clear, however, that QoL and depression are quite strongly related to one another, even if it is not possible to say that one is unambiguously caused by the other.

Discussion

The overlapping relationship of QoL and depression has been a focus of many studies attempting to explain which the precursor is. Contradictory perspectives have been reported by literature discussing

the predictor-outcome debate among depression and QoL. Moore et al. (2005) reported that people use their current affective state as a basis for making judgments of how happy and satisfied they are with their lives, and that depression influenced individual QoL by lowering the person's objective QoL. Another study found that depressed RTRs tend to be less satisfied with their QoL (Szeifert et al., 2009). On the other hand, poor QoL can make people depressed (Akman et al., 2003). However, de Leval's (1995, 1999) theoretical model explains this relationship using a timeline perspective that attempts to clarify the issue. This model describes the possible relationships between depression and QoL in a "three-time-dimension" of the past-present-future. Time perceptions of the past, present, and future can be both subjective and objective. According to this model, depression influences time perception, depressed people perceive 'time to pass slowly' as compared to those who are not depressed. They suggest that depressed individuals' temporal focus is more on the past than future as compared to others (Mundt, Richter, van Hees, & Stumpf, 1998).

In de Leval's theory (1995, 1999), the focus of these two concepts is described in terms of timeline, since depression is placed on the 'past-present timeline' and QoL is placed on the 'present and future timeline'. The larger the gap in these time dimensions, the lower the QoL. Since the present longitudinal study did not measure 'aspired/future QoL', it can be suggested that 'satisfaction with QoL' and 'being depressed' both are 'consequent feeling' as a result of individual's life orientations and perceptions. These may vary depending on the way they perceive their life and makes them satisfied or depressed.

It is worth mentioning that the individual attributions among transplant recipients may differ from other populations. Another key issue is the identification of etiological factors for depression among RTRs. It is important to understand why recipients feel depressed. The qualitative analysis explains the reasons and factors attributed to feeling depressed.

In this case, qualitative interviews can be conducted to clarify what made recipients depressed or less satisfied with QoL. It seemed that satisfaction with QoL varied due to differences in personality type, life orientation, perceptions and experiences during the phases of loss of native kidney and transplantation. The differences in experiences with health care, family, social and occupational relationships, and expectations of transplant outcomes determined their depression and perceived QoL. It can be said that being depressed or less satisfied with QoL both are determined by individual

personality types, belief systems, and life experiences (Lari, Tamburini, & Gray, 2004). Both depression and QoL satisfaction can be a consequence of these factors (Warnecke et al., 1996).

The study addressed the issue of the causal order of the effects using cross-lagged correlations, as there is some uncertainty about the potential direction of the effects. For example, the depressed may be depressed because their QoL is unsatisfactory or it could be that being depressed causes one to think that life is less good.

The strong correlations between depression and QoL suggest that it would have been equally valid to have focused on depression. It points to the issue that satisfaction with QoL might be simply another aspect of depression rather than a distinct construct in its own. Although, there is some literature that describes depression and QoL as distinct constructs, the conceptual status and causal relationships among these two concepts remain unclear (Fiebiger, Mitterbauer, & Oberbauer, 2004). Since, the findings of the present study did not find any causal relationship between depression and QoL, so it cannot be determined whether depressed recipients have less satisfied QoL or those less satisfied with their QoL tend to become depressed (Fisher, Gould, Wainwright, & Fallon, 1998). This suggests an overlapping relationship among these constructs raising a few questions; firstly, is QoL worth retaining in addition to depression (which is relatively better understood both medically and socially)? Secondly, does QoL evaluation to the study give us something in addition to depression?

Depression is an affective state with potential environmental, biological, and psychological causes. Similarly, subjective QoL is an individual's perception of overall life, physical, and mental well-being. Satisfaction and depression both have the emotive component in common and can be a cause or outcome of individual experiences and perceptions of life and due to this similar nature of both concepts, a distinct causal priority could not be found. A lack of causal priority suggests that depression and QoL satisfaction are two aspects of the same concept. Marked differences in these variables could not be observed since most RTRs in the present study were not 'clinically depressed' and had only minimum or mild level of depression, so a relationship between those 'clinically depressed' and their respective level of QoL could not be explored. Minimum and mild level of depression is not considered significant enough to have an impact on one's life. The relatively restricted range of variables can be an explanation for failing to find a causal order. Thus, it is really not possible to find and understand, if depression causes QoL, but we do find one thing that since RTRs were mostly satisfied with QoL, so they had minimal level of depression. A possibility of RTRs being

satisfied with their QoL but feeling depressed at the same time also exists, since the correlation was not perfect indicating a variability in QoL and depression that is not shared.

An important consideration is the way QoL is conceptualized, defined, and measured in a study and the specific population in question that determines the context and attributions of participants for being depressed (Gentile et al., 2013). In this longitudinal study, the RTRs responded to BDI-II items as a consequence of what they felt after the transplant. Their depression level indicated their affective condition being a transplant recipient. Since, a number of socio-demographic factors can cause an individual to be depressed, e.g., financial difficulties, relationship problems, rejections and/ or physical illness that need to be considered in future analysis. However, before making an assumption about what causes what, it is important to clarify the attributional styles and appraisals in a population.

The findings of the present study suggest that the direction of causal relationships among QoL and depression cannot be determined if indeed there is a causal relationship involved. Although, research suggests that QoL is influenced by depression, but the important question is 'what makes these people depressed?' The underlying reasons/factors and precipitators of depression among recipients need to be known to clarify whether they were depressed even before transplant or depression followed as a consequence of renal transplant.

Conclusion

QoL is a focus for examining health outcomes which also encompass psychological well-being and affective states such as depression. The findings suggest that depression and QoL are reciprocally related. A strong overlap is found among these constructs. Keeping in view the homogenous sample, comprising of recipients with good graft functioning and reporting minimum to mild level of depression, it still needs further clarification with future studies measuring these constructs by comparing depressed vs. nondepressed recipients as well as those with a poor and good graft functioning. On the other hand, considering the findings and the de Leval's model, QoL does not appear as a particularly distinct construct. It suggests that psychological aspects cannot be considered as distinct causal factors. It can be said that QoL is an umbrella term that involves perceptions of four major domains of life measured as overall QoL. Thus, QoL satisfaction seems to be determined by how they perceive and feel about their health functioning; family and social relationships; financial and economic condition (amenities of life);

and psychological well-being (mood/affective condition, self-esteem, self-fulfillment, etc.). It does raise a question as to why these constructs are measured separately as psychosocial factors besides overall QoL.

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