

# Long-term health-related quality of life in living liver donors: A south Asian experience

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## Abstract

**Aim:** The aim of this study was to evaluate long-term health-related quality of life (HRQOL), changes in lifestyle, and complications in living liver donors at a single transplant center from southern India.

**Methods:** A total of 64 consecutive living liver donors from 2008 to 2011 were evaluated; 46 of 64 donors completed the short form 36 (SF-36) via telephonic interviews or clinic consultations. Mean follow-up was 48 months (range: 37-84 months).

**Results:** There was no mortality in the donors evaluated. Overall morbidity was 23%, which included wound infections (4.3%), incisional hernia (2.1%), biliary leak (4.3%), and nonspecific complaints regarding the incision site (15.2%). All 46 donors who completed the SF-36 had no change in career path or predonation lifestyle. A total of 40 of 46 (87%) donors had no limitations, decrements, or disability in any domain, while six of 46 (13%) had these in some domains of which general health (GH) was most severely affected.

**Conclusions:** Living donor hepatectomy is safe with acceptable morbidity and excellent long-term HRQOL with no change in career path or significant alteration of lifestyle for donors.

## KEYWORDS

biliary complications, complications, donor hepatectomy, follow-up, HRQOL, outcomes

## 1 | INTRODUCTION

Published outcomes of living liver donors from the Indian subcontinent are scarce and are limited to three publications, one of which reported on a single-donor mortality.<sup>1</sup> We undertook a retrospective study of our living donor liver transplantation (LDLT) donors with specific regard to long-term outcomes and health-related quality of life (HRQOL) covering a 4-year period and herein report the results.

## 2 | PATIENTS AND METHODS

### 2.1 | Study design

This was a cross-sectional follow-up study carried out to collate data from donors concerning their HRQOL and long-term outcomes after

donor hepatectomy utilizing a formal quality of life (QOL) measurement tool such as the short form (SF) 36 in English or translated to native language with responses recorded on the form. Translations in local language, if required, were performed by the person collecting the information on phone or in clinic; 64 consecutive living liver donors in an arbitrary period of 4 years between January 2008 and December 2011, which resulted in a minimum follow-up period of 3 years, were selected for the survey. Records of all patients who had undergone LDLT in this period were traced from our transplant database. Recipient and donor details along with their gender, body mass index (BMI), age and date of donation, months from donation, disease etiology, and relevant recipient comorbidities were collated from a computerized transplant database. Utilizing a combination of the radiology records and patient files, the graft type (lobe), graft recipient weight ratio (GRWR), and donor future liver remnant (FLR) were

found. There were two groups of grafts: the right lobe graft group (RG) and a left lobe graft group (LG).

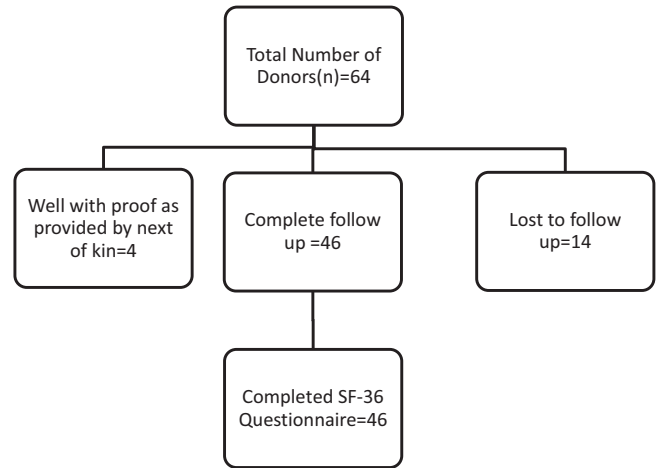
All the donors of recipients thus identified were then invited for a clinic review if they were within the same state or for a telephonic interview if out of state. Donor privacy was assured.

## 2.2 | Measures

We evaluated the HRQOL of living liver donors with the Short Form-36 (Version 2) questionnaire. Responders also reported hospital visits and their reasons, days off work due to donation-related problems, development of new medical or surgical problems which may or may not be directly related to donation, and comorbidities. As norm-based data on Indian population are unavailable, we used United States (US) population norm-based data from 1998 to calculate norm-based scores, mental composite score, and physical composite score (MCS and PCS). In addition to the SFs, we decided to insert two further unique components into the questionnaire to assess whether the donation or associated surgery had any impact at all on long-term HRQOL. We asked regarding the current status in terms of occupation compared to predonation and as to whether there had been any change in their occupation or, designs on their future occupation, to those who were not already in fixed work (eg, students). The answers were divided into three fixed choices—Excellent—applied when these donors had no restrictions on QOL, career aspirations, or daily tasks and were without any symptoms on direct and specific questioning; Good—applied when these donors had no restrictions on career aspirations or daily tasks; however, some impairment in QOL not directly related to surgery/site or mild symptoms had been noted; Poor—applied when these donors had restriction in both QOL and daily activities or had significant symptoms related or unrelated to surgery/site. As a significant proportion of the donors were not in full-time work even prior to donation (mainly women who were home makers), we asked a further question to remove any consequent bias. Donors were asked if there had been any change in their career path (CCP) either directly or indirectly due to the donation surgery or process with a dichotomised yes or no answer (NCCP applied when there was no change in career path [example: students started working; housewives remained housewives], CCP applied when there was change in career path [directly related or unrelated to surgery]).

## 2.3 | Follow-up

For the purposes of the follow-up analysis, three groups were separated: (i) Complete follow-up—where we met the donors during clinical consultations or spoke to them via telephonic calls and they completed the SF-36 form; (ii) Well on discharge, no or verbal follow-up—all these donors were well at time of discharge and are still in occasionally verbal contact. They did not attend a recent clinic or answered questions about their health or complete SF-36 questionnaires; (iii) Well to date with proof—verbal proof of well-being by next of kin. These donors were excluded (Figure 1).



**FIGURE 1** Donor follow-up algorithm

## 3 | RESULTS

The number of liver transplants steadily increased from 2008 to 2011 (5, 8, 14 and 37 per year, respectively). The underlying etiology of liver disease is shown in Table 1. Sixty of 64 donors (94%) were from within the country and four were from abroad (one each from the United Arab Emirates, Syria, Oman, Saudi Arabia). Of the 60 from India, 34 (53%) were from within the state of Andhra Pradesh (in which this study was conducted) of whom 16 (47%) were from within the same city (Hyderabad).

Donor relationship with recipients and donor characteristics are shown in Table 2. Complications (Table 6) such as wound parasthesias were self-reported at the time of interview or clinic visit. For major complications such as biliary complications and incisional hernias which were managed in the hospital, details were obtained from medical records. The 48 donors whose BMI was <28 had no complications except in one patient who developed an incisional hernia. In comparison, of 16 donors whose BMI was >28, two donors had biliary complications (two bile leaks with one subsequent stricture formation). In the period studied, there was no mortality among the 64 donors. The overall mean future liver remnant (FLR)

**TABLE 1** Etiology of recipients

Etiology	(N)	%
Viral hepatitis	21	32.81
Nonalcoholic fatty liver disease	18	28.12
Alcoholic liver disease	11	17.19
Cryptogenic	6	9.38
Autoimmune hepatitis	2	3.13
Biliary atresia	2	3.13
PFIC	1	1.56
Budd-Chiari	1	1.56
Wilson's disease	1	1.56
Primary sclerosing cholangitis	1	1.56

PFIC, progressive familial intrahepatic cholestasis.

**TABLE 2** Relationship of donors to recipient and donor characteristics

Relation	(N)	%	
Partner (spouse)	12	18.75	
Sibling	13	20.31	
Parent	7	10.94	
Offspring	23	35.94	
Second-degree relatives	9	14.06	
Donor characteristics	All donors (n=64)	Respondents (n=46)	Nonrespondents (n=18)
Mean age	31.5 (19-52)	32.2 (19-52)	29.6 (21-48)
Gender			
Male	34	24	10
Female	30	22	8
Mean BMI	25 (16.5-36)	24.7 (16.5-36)	25.57 (19.3-35.9)
FLR and graft type	(RG: n=58, LG: n=6)	(RG: n=41, LG: n=5)	(RG: n=17, LG: n=1)
FLR RG (%)	35.52 (26.36-50.26)	35.1 (26.36-50.26)	36.58 (32.1-40.9)
FLR LG (%)	70.16 (35.36-81.36)	67.9 (35.36-76.6)	81.36
Comorbidities			
DM	1	1	0
Hypertension	1	1	0
Hypothyroidism	1	1	0
2 Comorbidities	1 (DM+HTN)	1	0

BMI, body mass index; RG, right lobe graft; LG, left lobe graft; FLR, future liver remnant; DM, diabetes mellitus; HTN, hypertension.

was 39% (Median: 36; Range: 26-81). Of 64 donors, in eight of them, the FLR was <30%, while the FLR was >30% in 56 donors. There were no differences in morbidity rates or SF-36 scores in donors arbitrarily dichotomized into FLR less or more than 30%. All five donors who had major complications (biliary leak [2], incisional hernia [1], and wound infection [2]) had FLR >30%. There were 58 (91%) right lobe and six (9%) left lobe donors. The mean follow-up was 48 months (Range: 37-84) in the 50 donors who had complete follow-up. Current status, working, and career path are shown in Table 3.

**TABLE 3** Donor outcomes in terms of career status, restrictions, and working

Donor outcomes	N=46 (%)
Current status	
1. Excellent	40 (87)
2. Good	5 (11)
3. Poor	1 (2)
No change in career path	46 (100)
Change in career path	0

Excellent: No restrictions on quality of life, career aspirations, or daily tasks and were without any symptoms; Good: No restrictions on career or daily tasks, but some impairment in quality of life not directly related to surgery/site; Poor: Restriction in both quality of life and daily activities or symptoms directly due to surgery/site or were unwell and also suffering from many other symptoms which were not related to surgery/site.

### 3.1 | Short form 36 HRQOL assessment

Of the 64 donors, only 46 donors (72%) had answered the SF-36 questionnaire. In 40 of 46 (87%) donors, all eight domains of SF-36 showed no limitations, decrements, or disability (Table 4) and six of 46 (13%) donors showed these in some domains (Table 5).

## 4 | DISCUSSION

Reliable published data on donor outcomes from the Indian sub-continent where majority of liver transplants are LDLTs are lacking, and there are no data on HRQOL. Published mortality rates among donors are variable but range from 0% from 1.7%.<sup>2</sup> There were no donor deaths in the 64 donors from 2009 to 2011 we analyzed and hence is not discussed further. The time period chosen between 2008 and 2011 was to allow a long-term assessment of QOL. A minimum follow-up of 37 months, which is 3 years postdonation, allows for most complications to manifest and the donors to return to their original chosen career path. A survey at this point of time would reflect any "long-term" effect on QOL, which was the main aim of the study. Donor morbidity is again variable in the published literature and ranges from 10% to 67%.<sup>13-17</sup> The overall morbidity in our series was 23%, including biliary complications, wound infections, incisional hernias, and others. Overall biliary complications in major series of LDLTs range from 5% to 12% of donors.<sup>4-6</sup> In the current study, two

**TABLE 4** Short form-36 (SF-36) parameters for all donors

SF-36 parameters	SF-36 scores for all donors who answered questionnaire (n=46)	
	Mean	Range
Physical function	56.55	44.6-57.1
Role physical	55.73	35.0-56.2
Role emotional	54.61	23.7-55.3
Vitality	69.47	46.7-70.4
Mental health	63.2	45.9-64.1
Social function	56.39	24.6-57.1
Bodily pain	61.88	33.8-62.7
General health	61.25	31.2-64.0
Physical composite score	58.16	38.7-59.2
Mental composite score	61.16	34.0-62.4

Based on the United States (US) norm-based data of 1998 with mean of 50 and standard deviation of 10 in each parameter in the general population. Highest scores in each domain would be PF: 57.1, RP:56.2, RE: 55.3, VT: 70.4, MH: 64.1, SFn: 57.1, BP: 62.7, GH: 64 PCS: 59.2, MCS: 62.4.

of 46 patients (4.3%) had biliary leak and one developed a subsequent stricture, which was managed by endoscopic retrograde cholangiopancreatography (ERCP) and stenting. Wound infection is uncommon, and only two of 46 (4.3%) patients had a wound infection, which resolved with regular dressings and secondary healing. There was one incisional hernia (one of 46, 2%). All of these complications occurred within the first year of donation. A significant percentage of donors (seven of 46, 15%) still have persistent paresthesias along the incision site (a reverse L incision). Such problems are commonly encountered in donor operations.<sup>7</sup> The occurrence of complications does not seem to correlate with comorbidities as none of the specific complications (4/46) occurred in patients with comorbidities, emphasizing technical faults rather than patient profile per se. However, Takada et al.<sup>8</sup> reported a significantly decreased HRQOL scores in donors with two or more comorbidities simultaneously. Most donors stated that they took about a year to feel near normal, which is consistent with other studies.<sup>9</sup> This is also corroborated by low incidence of complications 1 year after donation (<1%).<sup>6</sup> Donor complications are summarized in Table 6 and classified according to Clavien-Dindo classification.<sup>10</sup> Abecassis et al.<sup>11</sup> also recently reported in the adult-to-adult living donor liver transplantation (A2ALL) study that almost 40% will have complications and the majority within the first year of donation.

#### 4.1 | Quality of life and ethical issues

Health-related QOL was very satisfying with most donors (45/46) leading "normal" lives without any modifications to predonation lifestyle. The QOL was not related to left or right graft donation, and both groups had similar scores, although LG donors were fewer (6/64). In similar studies, QOL of donors have been compared to general population in their countries.<sup>12,13</sup> As might be expected, most donors have a good preoperative QOL and have few comorbidities.<sup>13</sup> All donors are

**TABLE 5** Short form-36 (SF-36) scores for donors who had some limitations, decrements, or disability (N=6)

	PF	RP	RE	VT	MH	SFn	BP	GH	PCS	MCS
Donor 1	57.1	56.2	55.3	70.4	64.1	57.1	62.7	45.3	54.5	62.3
Donor 2	57.1	56.2	55.3	70.4	64.1	57.1	62.7	35.9	52.2	62.4
Donor 3	52.9	56.2	55.3	60.9	52.7	57.1	58.5	45.3	53.6	55.9
Donor 4	48.8	56.2	55.3	60.9	52.7	57.1	58.5	45.3	51.8	56.9
Donor 5	44.6	35	23.7	46.7	45.9	24.6	33.8	31.2	38.7	34
Donor 6	57.1	56.2	55.3	70.4	64.1	57.1	62.7	54.6	56.8	62.1
Number of donors with limitations, decrements, or disability in each domain	3/46	1/46	1/46	3/46	3/46	1/46	3/46	6/46	6/46	6/46
Mean	52.93	52.66	50.03	63.28	57.26	51.68	56.48	42.93	51.26	55.6
Range	44.6-57.1	35.0-56.2	23.7-55.3	46.7-70.4	45.9-64.1	24.6-57.1	33.8-62.7	31.2-54.6	38.7-56.8	34-62.4

Tabulated list of donors who had anything less than a "perfect" (highest possible) score in any given SF-36 domain. Highest or "Perfect" scores in each domain would be PF: 57.1, RP:56.2, RE: 55.3, VT: 70.4, MH: 64.1, SFn: 57.1, BP: 62.7, GH: 64 PCS: 59.2, MCS: 62.4.

PF, physical function; RP, role physical; RE, role emotional; VT, vitality; MH, mental health; SFn, social function; BP, bodily pain; GH, general health; PCS, Physical Composite Score; MCS, Mental Composite Score.

**TABLE 6** Donor complications, grading, and management

Complication	N (%)	Management	Clavien-Dindo Grade
Bile leak/Stricture	2 (4.3)	ERCP/Stenting	III
Wound infection	2 (4.3)	Conservative/Dressings	I
Incisional hernia	1 (2)	Operative repair	III
Paresthesias/Nonspecific complaints around incision	7 (15)	Symptomatic/Conservative	I

ERCP, endoscopic retrograde cholangiopancreatography.

working (46/46) with no compromise in physical activity as required for their profession. The current profession of the donors varied from household work to even gymnasium instructors, which shows that the donor operation in no way hinders even strenuous work. Among donors with showing limitations, decrements, or disability in SF-36 ( $n=6$ ), the general health (GH) parameter was most severely affected with a mean score of 42.93 (range: 31.2-54.6). However, even in this group of donors, the mean physical functioning (PF) score was 52.93 (range: 44.6-57.1), reflecting the fact that PF is least altered, and hence, all donors fall in the NCCP group even with mildly decreased HRQOL scores. The patient who had biliary stricture and subsequent ERCP had particularly poor scores, reflecting the impact of biliary complications on HRQOL. The high scores in our study, although corroborated with clinical data, should be viewed with caution as responders to the SF-36 may have cultural differences, obligation to the family, or just the desire to please the interviewing doctor.<sup>14</sup>

Even among donors whose recipients had died and who were surveyed (6/14, 42%), the satisfaction levels were high and they expressed no regrets for their decisions. Their response to the request to fill up the questionnaires and repeating laboratory tests was similar to the donors with surviving recipients (four of six, 66.6%). This is in contrast to some other studies in which donors whose recipients died expressed dissatisfaction or were nonresponsive.<sup>15</sup>

The A2ALL study data recently published suggested that the PCS and MCS scores from the donors are generally higher than the general population and that predictors for lower scores were recipient's death within the 2 years prior to the survey and education less than a bachelor's degree.<sup>16</sup> Spanning across continents, these few studies show that HRQOL remains largely unaffected after liver donation. Attempts at developing specific QOL scales for living liver donors have been made,<sup>17</sup> but such scales have as yet not been validated across various centers and SF-36 remains the primary mode for QOL assessment.

Key differences between our transplant program vs the West include our dependence on living donors (owing to low donation rates<sup>18</sup>) while deceased donor liver transplantation (DDLT) is the mainstay in the Western countries.<sup>19</sup> There is a lack of an integrated agency like United Network for Organ Sharing (UNOS) in India, which not only helps organ allocation but also collects follow-up data on donors including complications.<sup>20,21</sup> Deaths in patients with chronic liver disease (CLD) are much greater in the East, and the availability of transplant services are sporadic and far below demand.<sup>22</sup>

Only close first-degree relatives are allowed to donate without special permission, and all other donors require clearance from an

authorization committee,<sup>18</sup> while guidelines may not be as stringent for unrelated donors in the West.<sup>23</sup> As the CLD patient here is more reliant on a living donor, there is a need to reliably evaluate donor outcomes including HRQOL and ensure adequate standards in developing countries like India.

## 5 | CONCLUSIONS

At a median follow-up of 44 months, 88% of our donors had an "excellent" score, with no symptoms, restrictions on QOL, career paths, or daily tasks. Within reason, neither BMI (within the range of 16.5-36) nor FLR (within the range of 26.36-50.26 for RG) appeared to make much of a difference to postoperative outcomes.

Limitations include a nonvalidated translation in native language for six of 46 donors, use of US norm-based data for calculating QOL of Indian population, incomplete follow-up of donors, and a potential for recall bias.

In spite of its shortcomings, the current study shows that donor hepatectomy is safe and offers a good HRQOL postdonation.

## CONFLICTS OF INTEREST

None.

## AUTHORS' CONTRIBUTIONS

Cherian PT and Mishra AK: Designed the case study, analyzed literature, and prepared the manuscript; SM Faisal Mahmood, Venugopal Kota, R Ravichandra and S Mohan: Contributed to manuscript preparation; Rela MS: Completed final revision of the manuscript.

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