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Original Article

A study on quality of life among lower limb amputees at a tertiary prosthetic rehabilitation center

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ABSTRACT

Background: Limb loss is one of the most physically and psychologically devastating events causing major disfigurement, rendering people less mobile, and at risk for loss of independence. This research aims to study the quality of life (QoL) among lower limb amputees (LLAs) at a tertiary prosthetic rehabilitation center.

Methods: The present study is based on the self-perceived QoL of new LLAs reporting to a tertiary prosthetic rehabilitation center for prosthesis using World Health Organization Quality of Life-BREF scale.

Results: 35% of this study population were currently serving personnel of Indian Armed Forces, while 17.3% were dependents. 17.3% of the study participants were retired Indian Armed Forces personnel. 51.5% of study participants had undergone a lower limb amputation following trauma; 22.7% of the traumatic amputations had resulted from road traffic accidents, 16.7% from trauma sustained following railway accidents, and combat-related injuries accounted for 11.4% of traumatic lower limb amputations. Diabetic foot/gangrene was responsible for 32% of lower limb amputations in the current study. Overall QoL score of 78.76 (standard deviation [SD] = 15.03) was seen revealing highest mean score in environmental domain 26.59 (SD = 5.38), followed by physical domain, psychological domain, and lowest score being in social domain.

Conclusion: When judging the success or failure of lower limb amputation, the assessment of QoL outcome is paramount. A number of factors need to be taken into consideration to ensure holistic reintegration of the amputees back into the society.

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Introduction

The history of amputation may be traced back to the Neolithic era. In modern medicine, amputation is resorted to as the last measure when saving a limb becomes a near-impossible scenario.¹ Limb loss, in addition to causing disfigurement, renders people less mobile and at risk of loss of independence. Loss of a limb has major economic, social, and psychological effects, both on the individual as well on his/her social domain.²

In developing countries like ours, causes of amputation is quite often influenced by degree of industrialization, transportation system, and safety and access to medical care. A study conducted in 2009 reported trauma as the cause for majority of amputations in India. Various other studies, conducted at Chennai and Kolkata, have also cited road traffic accident (RTA) as the prime cause of amputation in the Indian subcontinent.³

Previous literature indicate that lower extremity injuries account for almost 50% of combat wounds among US military personnel deployed in Iraq and Afghanistan. In conflict scenario, amputation often ends up being the only treatment option available.⁴ Mine blast injuries leads the way as the predominant cause among cases due to trauma. Other important causes of battle field injuries are those resulting from gunshots and shrapnel. RTA is the second most common cause of disability. Railway accidents also constitute significant number of cases. Cold injuries also contributed for a large number of cases, because of stationing of troops at high altitude and snow covered areas.⁵

The World Health Organization Quality of Life (WHOQoL) Group defines quality of life (QoL) as an individual's perception of his/her position in circumstance of the culture and values in which he or she lives and with respect to his/her goals, expectations, principles, and concerns.⁶ Despite growing popularity of QoL and amputee studies worldwide, it remains a relatively poorly studied concept in developing countries such as India. The aim of this study was to assess the QoL among lower limb amputees (LLAs) at a tertiary prosthetic rehabilitation center. The key objectives of the study were to study the QoL among LLAs under various domains of the WHOQOL-BREF scale to determine sociodemographic factors associated with QoL among LLAs and to suggest suitable recommendations for improving QoL in LLAs found in the study.

Materials and methods

This was a descriptive, tertiary-care center–based cross-sectional study carried out at a prosthetic rehabilitation center located at Pune. All fresh/new LLAs, both men and women, 18 years of age and above, irrespective of the level of amputation, and reporting to the tertiary prosthetic rehabilitation center, were included in the study. In the current study, fresh/new LLAs were defined as all individuals who had undergone a lower limb amputation (unilateral/bilateral) in the preceding 6 months from the date of conduct of the study and who had never got a trial of or been fitted with a lower limb prosthesis. Old amputees reporting to the tertiary prosthetic

rehabilitation center for refitting or change of old prosthesis and individuals with congenital amputation or amputation of digits of the lower limb only were excluded from the study.

To estimate impact of amputation on QoL among LLAs reporting to the tertiary prosthetic rehabilitation center, using WHOQOL-BREF scale, under various domains, with 95% confidence interval and assumed error of margin with standard deviation (SD) from previous literature enlisted in Table 1,⁷ the minimum required sample size was calculated as 141; however, to achieve the objectives of the study, 150 participants were taken into consideration for this project.

The WHOQOL-BREF (field trial version) self-administered questionnaire was used as the data collection tool. The WHO has developed the WHOQOL-BREF scale, which captures many subjective aspects of QoL. WHOQOL-BREF is one of the best known instruments that has been developed for cross-cultural comparisons of QoL and is available in more than 40 languages, including Hindi.⁸

The study participants were administered the questionnaire in their language of preference (English/Hindi), with the interviewer thoroughly explaining to them the purpose of the study and approach to selecting the response they felt was most applicable to them. Written informed consent was obtained from each participant, and ethical clearance was obtained from the institutional ethical committee prior to the conduct of the study.

The field-trial version of the WHOQOL-BREF contains 26 items covering four different domains of QoL

- Physical health (7 items)
- Psychological health (6 items)
- Social relationships (3 items)
- Environmental health (8 items)

Out of 26 items, 02 items are examined separately, one addressing an individual's overall perception of his/her QoL and the other regarding perception of his/her own health. The domain scores are scaled in a positive direction, and the mean score of items within each domain is used to calculate the domain score. The raw scores are converted into transformed scores using an SPSS syntax file, the latter having being obtained by the authors from WHO designated researcher. Data on sociodemographic factors were collected using a pilot-tested validated questionnaire. The data were analyzed using the SPSS (version 20). Normality test (Kolmogorov-Smirnov Test) was applied to test domains of QoL and the subgroups wherever required. Homogeneity test was applied to test

Table 1 – Sample size calculation.

S.No.	Domains	Error of margin/precision	Standard deviation (σ)	Sample size
1.	Q1-QOL	15%	0.85	123
2.	Q2-Health	15%	0.91	141
3.	Physical	5%	18.70	54
4.	Psychological	5%	17.93	49
5.	Social	5%	19.09	56
6.	Environmental	5%	15.19	35
QOL, quality of life.				

whether subgroups were homogenous. Kruskal-Wallis test was applied wherever the normality or homogeneity tests failed. Analysis of variance was applied for the groups satisfying the normality and homogeneity tests. Students unpaired t-test was applied wherever two groups were there.

Results

The various sociodemographic characteristics of the study participants are enlisted in Table 2.

Table 2 – Sociodemographic and clinical characteristics of study participants.

S.No.	Characteristic	Frequency (N = 150)	Percentage (%)
1.	Gender		
a.	Male	110	73.3
b.	Female	40	26.7
2.	Age (yrs)		
a.	20–39	58	38.7
b.	40–59	40	26.7
c.	60–79	48	32.0
d.	80–99	04	2.7
3.	Educational status		
a.	None at all	18	12.0
b.	Primary school	14	9.3
c.	Middle school	35	23.3
d.	High school	64	42.7
e.	Beyond high school	19	12.7
4.	Marital status		
a.	Unmarried	33	22.0
b.	Married	91	60.7
c.	Widow/widower	22	14.7
d.	Separated	01	0.7
e.	Divorced	03	2.0
5.	Serving/retired/civilian		
a.	Serving	53	35.3
b.	Serving (dependents)	19	12.7
c.	Retired	26	17.3
d.	Retired (dependents)	10	6.7
e.	Civilian	42	28.0
6.	Employment status		
a.	Working	72	48
b.	Pensioner	29	19.3
c.	Unemployed	02	1.3
d.	Dependent wholly on family members financially	47	31.3
7.	Socio-economic status		
a.	Upper class	107	71.3
b.	Upper middle class	34	22.7
c.	Middle class	08	5.3
d.	Lower middle class	01	0.7
e.	Lower class	0	0
8.	Time elapsed since amputation		
a.	1–3 months	85	56.7
b.	4–6 months	65	43.3
9.	Side of amputation		
a.	Right	67	44.7
b.	Left	52	34.7
c.	Bilateral	31	20.6
10.	Level of amputation		
a.	Above knee	60	40.1
b.	Below knee	90	60

In the current study, 46% of the study participants had undergone the amputation at a civil hospital, 40.6% amputations had been performed at a military hospital, and 13.4% of the amputations had been performed at an Ex-servicemen Contributory Health Scheme empanelled hospital.

In the current study, trauma was the most common cause of amputation, among which RTAs were the major cause of lower limb amputation among the study participants at 34 (22.7%), followed by trauma sustained because of railway accidents (fall from moving train on attempting to alight from or get into a moving train) at 25 (16.7%). The second most common cause of lower limb amputation was diabetic gangrene/diabetic foot, with 48 (32%) having cited the same. Seventeen (11.4%) of the study participants had undergone a lower limb amputation following injury sustained during combat operations (splinter injury/mine blast injury/firearm injury). Vascular causes contributed to lower limb amputation among 12 (8%) of the study participants, and malignancy was the cause of amputation in 8 (5.4%) of them. Five (3.5%) of the study participants cited other reasons for having undergone a lower limb amputation. (Graph 1)

Among the study participants, 83 (55.3%) had no other morbidities co-existing along with the lower limb amputation. Forty-three (28.7%) of the participants had preexisting diabetes mellitus type II, while 10 (6.7%) had both diabetes mellitus type II and primary hypertension. Five (3.3%) of the participants had preexisting primary hypertension only, while four (2.7%) had more than 2 co-existing diseases, namely diabetes mellitus type II, ischemic heart disease, and primary hypertension.

The study participants had an overall QoL score of 78.76 (SD = 15.03). The current study revealed that highest mean score was in environmental domain with mean QoL score of 26.59 (SD = 5.38), followed by physical domain with mean score of 19.71 (S.D = 3.30), psychological domain with mean score of 16.86 (S.D = 4.55), and lowest score being in social domain with mean score of 9.61 (S.D = 3.25). In the current study, the transformed domain scores were found to be highest in the social domain (mean 71.66, SD = 20.50), and lowest score was found to be in the physical domain (mean = 48.92, SD = 16.45).

Graph 1 – Distribution of study participants as per cause of lower limb amputation.

Table 3 – Mean score of different QoL domains among study participants.

Category	Mean domain score	Transformed domain score (on scale of 100)
Physical domain	19.71	48.92
Psychological domain	16.86	53.35
Social domain	9.61	71.66
Environmental domain	26.59	58.10
QOL, quality of life.		

In the current study, the transformed domain scores were found to be highest in the social domain (mean = 71.66, SD = 20.50), and lowest score was found to be in the physical domain (mean = 48.92, SD = 16.45). These findings are similar to those of a study conducted by Adegoke et al., where LLAs had highest score in the social domain, followed by environmental domain and psychological domain and lowest in physical domain (mean = 52.38; SD = 22.29).⁹

Overall QoL score of 80.87 (SD = 15.35) was observed among the male study participants, while it was 72.95 (S.D = 12.54) in females. Higher scores were observed among males under all domains compared with that in females. A statistically significant association between both gender groups was observed only under the environmental domain ($p < 0.05$).

Highest QoL score was found in the age group of 40–59 years, with a significant score within the social domain (p value = 0.03) (Table 4). Higher overall QoL scores were observed among males under all domains compared with females. A statistically significant association between both gender groups was observed only under the environmental domain (p value = 0.03) (Table 4).

As far as level of education of the study participants was concerned, a statistically significant association among different education groups was found only under the social domain (p value = 0.0001) (Table 4).

The overall QoL score was highest for serving personnel at 81.08 (SD = 13.96), followed by retired personnel at 76.69 (SD = 17.64) and civilians at 76.54 (SD = 14.14). No statistically significant association was found among different employment status groups under any of the QoL domains ($p < 0.05$).

Overall QoL score of 78.77 (S.D = 16.50) was found among study participants who had undergone a lower limb amputation within preceding 1–3 months time period, while the score was 78.73 (S.D = 12.99) for those within preceding 4–6 months time frame. A statistically significant association between different time periods elapsed because amputation was found under social domain and overall QoL (p value = 0.028) (Table 4).

Discussion

Trauma following RTAs accounted for 22.7% of the lower limb amputations in the current study, followed by trauma sustained as a result of railway accidents (fall from moving train on attempting to alight from or get into a moving train) at 16.7%. The findings of the present study are consistent with other similar studies depicting that trauma is the leading cause of lower limb amputation followed by diabetes or its related complications.^{10–12}

The current study showed a statistically significant association between the various age groups and QoL score within the social domain only (Table 4). The overall QoL scores as well as individual domain scores was found to be better in age

Table 4 – Association between various sociodemographic factors and QoL scores.

Sociodemographic factor	QoL scores within significant domain (Mean ± SD)	Domain showing significant score	p-value
Age (yrs)			
20–39	10.50 ± 2.59	Social	0.03
40–59	10.82 ± 2.91		
60–79	7.85 ± 3.41		
80–99	5.75 ± 1.25		
Gender			
Male	27.38 ± 5.48	Environmental	0.03
Female	24.42 ± 4.47		
Level of education			
None	6.94 ± 2.07	Social	0.0001
Primary school	7.71 ± 2.92		
Middle school	9.14 ± 3.97		
High school	10.54 ± 2.75		
Beyond high school	11.26 ± 2.18		
Socio-economic class			
Upper class	17.18 ± 3.70	Psychological	0.0001
Upper middle class	15.85 ± 3.53		
Middle class	17.75 ± 12.66		
Lower middle class	10.00		
Time elapsed since amputation			
1–3 months	9.44 ± 3.49	Social	0.028
4–6 months	9.83 ± 2.92		
QOL, quality of life; SD, standard deviation.			

groups 20–39 years and 40–59 years and lower in those >60 years of age. In a study conducted in Pakistan, individual QoL domain and overall QoL scores were found to be higher in groups aged 20–40 years and 41–60 years; however, no statistically significant association was found within any of the four QoL domains and different age groups.¹³ According to findings of another study, lower QoL scores in older age groups was attributed to the possibility that these people seek comfort and maintained social standing by prioritizing personal relationships rather than their level of physical functioning because of age-related musculoskeletal disorders and restrictions of physical activity thereof.¹⁴

The current study found that majority of LLAs comprised of males (73.3%), while females consisted of 26.7% of the study population. The preponderance of male amputees compared with female amputees may be because of the fact that it is mostly the male members of a household who venture out for purpose of work or undertake travel for the same; they are, hence, more at risk of road traffic and industrial accidents and amputation thereof. Also, majority of the serving military personnel in our study belonged to the non-officer ranks—a rank structure into which ladies are not eligible to be enrolled. This might be another reason why the frequency of lower limb amputations in males exceeded that of females amongst our study population. A study conducted by Sinha et al. at a limb-fitting and rehabilitation center based in Mumbai, India, also found that 88% of the respondents were males while females comprised of only 12% of the respondents.¹¹ The Global Lower Extremity Amputation Study states that the incidence of lower limb amputation is similar in both gender in some regions and higher in females than males in other regions, although the overall incidence is higher in men than women.¹⁵ In a study conducted by Adegoke et al., male participants scored higher compared with the female participants in overall QoL score; highest and lowest domain scores were found within the social and environmental domains.⁹

In the current study, 46% of the current study participants had undergone the amputation at a civil hospital, 40.6% amputations had been performed at a military hospital, and 13.4% of the amputations had been performed at an Ex-servicemen Contributory Health Scheme empanelled hospital. No studies quoting similar findings were found during review of literature for the same. The current study had 35.3% of study respondents belonging to the Indian Armed Forces. These personnel, during period of leave, may report to nearest civil service health facility in case of medical or surgical emergencies. In case of any traumatic event, including road traffic/railway accidents, these individuals may have to undergo major/minor surgeries, amputations included, at the civil health facility. They are later transferred to an Armed Forces hospital once their condition is stabilized. Hence, it is not only the 28% civilian population in this study that have undergone lower limb amputation surgeries at civil health facilities; some of the Armed Forces personnel might have also undergone initial treatment in a civil set up.

The current study showed a statistically significant association among different levels of education within the social domain of QoL. These findings are consistent with that of a study conducted by Adegoke et al., where LLAs had highest score in the social domain (mean = 63.23, SD = 23.01), followed

by environmental domain (mean = 60.40, SD = 18.84), psychological domain (mean = 55.17, SD = 15.27) and lowest in physical domain (mean = 52.38, SD = 22.29).⁹

Our study findings are suggestive of better adaptability of LLAs, with education till the level of high school or beyond, to postamputation body changes and enhanced social functioning and fair knowledge regarding their health status and attitude toward accessing existing healthcare services. Study participants with higher education might feel more socially equipped and find it easier to deal with cognitive, emotional, and social aspects of amputation.^{16,17}

Employment status is an important determinant of QoL, especially among the male population. In our country, it is the men who are primary earning members of the family and their status of unemployment has a direct impact on standard of living as well as sense of self-worth.

Overall QoL score was highest for those study participants belonging to upper socio-economic class, while score for the lower middle class was lowest. A statistically significant association was found between the different socio-economic classes within the psychological domain only. This finding may be attributed to the fact that greater financial stability ensures access to high quality curative and rehabilitative services, carefree access to essential items of daily living, both for self and family, and a sense of general well-being—factors that have a direct impact on an individual's perception of QoL. Studies assessing the association between lower limb amputations, socio-economic status, and QoL, especially at the level of tertiary health care service, are few.^{18–20}

There are very few QoL studies that have considered time since amputation in terms of months and its association with overall QoL score or individual domain scores. During the initial few weeks immediately following amputation, patients are admitted to the healthcare facility with medical and paramedical staff as attendees 24×7. The ward or hospital they are admitted to might have other patients who have undergone an amputation, leaving little scope for loneliness or feeling of isolation. However, once the postamputation wound heals and patients are transferred to the rehabilitation center, limb measurements are taken, and trial of prostheses is initiated. The presence of other LLAs at the rehabilitation center could have either a positive or a negative psychological impact on the new/fresh amputee. The amputees who have already been using a prostheses for a considerable period of time could act as a source of encouragement and inspiration to the new amputees; on the contrary, the new amputees, during this period, might feel dejected by constantly comparing their own level of mobility achieved (by use of wheelchair or crutches) with that of the older amputees who have already received a prostheses. This might be a possible explanation for the marginally higher overall QoL score among the respondents who had undergone the amputation 1–3 months back.

Conclusion

As has been demonstrated in our study, the overall transformed QoL domain score was lowest in the physical domain. Amputees have to adapt physically, socially, and psychologically to the change in structure, functioning, and appearance

of their body. Effective preamputation psychological counselling may prove useful in ameliorating the psychological distress of amputees and their anxiety related to the procedure and life thereafter.

Trauma was found to be the dominant cause of amputation in this study (51.5%), followed by diabetic complications (32%). Trauma following RTAs accounted for 22.7% of the lower limb amputations in the current study, followed by trauma sustained as a result of railway accidents (fall from moving train on attempting to alight from or get into a moving train) at 16.7%. Human factor is a significant determinant in occurrence of these injuries. Serving soldiers more often meet with road traffic and railway accidents while on leave, often being involved in reckless driving and absolute disregard to traffic rules. Commanders at all levels, unit Regimental Medical Officers (RMOs) and junior level leaders should repeatedly reinforce road safety rules and rail travel safety rules during Sainik Sammelans, daily evening roll-calls, health lectures, etc.

Considering diabetic complications were the second leading cause of lower limb amputation in this study, it becomes imperative that LLAs with co-morbid conditions need to have a holistic rehabilitation program which should include health education with respect to dietary modifications, daily exercise program, harmful effects of addictions (tobacco and alcohol consumption), and effects of uncontrolled blood sugar levels and blood pressure on overall health of the individual as well as long-term outcomes of amputated as well as normal limb.

Results of this study reinforce the fact that amputation continues to be associated with lower QoL scores. It is recommended that the participants receive a structured rehabilitation curriculum which is adapted to the specific needs of people with lower limb amputation. Prospective longitudinal studies are recommended to study the change in QoL over time and to assess its determinants. [Table 3](#)).

Conflicts of interest

The authors have none to declare.

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