

### Original Article

# Impact of disability in the quality of life of patients with traumatic brachial plexus injuries based on a questionnaire survey in a tertiary center in South India

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### ABSTRACT

**Objectives:** The aim of the study was to assess the disability and its impact in the health-related quality of life (HRQOL) and its various domains in patients with traumatic brachial plexus injury (TBPI).

**Materials and Methods:** A descriptive cross-sectional questionnaire survey was conducted on 41 patients with TBPI in a tertiary care center in South India. The assessment of disability and HRQOL was done as per the guidelines of the Gazette of India (2001) and WHO BREF questionnaire, respectively. The association between disability and HRQOL was determined using Chi-square test.

**Results:** All patients were males in the age group 16–60 years (mean age  $36.8 \pm 14.4$  years). Etiology was road traffic accident in 90.2% of cases. About 51.2% had pan-plexus injuries and 53.7% had their dominant limb affected. The mean total disability was  $80.39 \pm 13.86\%$  and the mean total HRQOL score was  $188.46 \pm 83.44$  out of 400. It was found that disability due to TBPI significantly reduced the HRQOL (Fisher's exact  $P = 0.005$ ) and the psychological domain was the most significantly affected ( $P = 0.017$ , Kruskal-Wallis test). Pan-plexus injuries with an involvement of dominant upper limb had significant impact in the HRQOL. Twenty-one patients (51.2%) complained of neuropathic pain and they had a significantly reduced quality of life (QOL) (mean QOL = 23.3,  $P < 0.001$ ). It was also found that productive age group (26–55 years) had a significantly reduced QOL as compared to the extreme age groups ( $P = 0.000$ ). Unemployed patients had a significantly reduced QOL as compared to those with permanent/temporary job ( $P = 0.024$ ). Marital status was found to have no significant relationship with the total HRQOL ( $P = 0.647$ ). Those belonging to the poor socioeconomic strata (below poverty line) had poor HRQOL as compared to those above poverty line and the relationship was found to be significant ( $P = 0.000$ ).

**Conclusion:** TBPIs significantly affected all domains of QOL, especially in unemployed patients in the productive age group in the poor socioeconomic strata. The pan-brachial plexus involvement of dominant upper limb and associated neuropathic pain were the most important factors which negatively affected the QOL. Among the codomains of the QOL, psychological domain was the most significantly affected irrespective of the severity of the injury.

**Keywords:** Disability, Quality of life, Traumatic brachial plexus injuries

### INTRODUCTION

Brachial plexus injury is a devastating traumatic event of the upper limb, leading to chronic disability. According to Jain *et al.*, 94% of the adult traumatic brachial plexus injuries (TBPIs) occurred following accidents like road traffic accidents of which 90% are due to motor cycle accidents.<sup>[1]</sup>

The most commonly affected are in their productive age group who are usually the breadwinners in our Indian families. Reduced functional capacity of an individual not only affects patient's quality of life (QOL) but also adversely affects the family. Apart from physical disability, a TBPI patient has the added burden of psychological, social, and vocational

issues.<sup>[2]</sup> Awareness of the long-term consequence of such an injury takes time to be acknowledged and accepted even by educated patients and their families.

Correlating impairment due to brachial plexus injury with disability gives a better understanding of the impact of injury on the QOL of the affected individual.

There are very few studies in the literature that focus on the disability and its impact on the QOL of the affected individuals.<sup>[3–5]</sup> Proper understanding of the disability due to TBPI will help in successful rehabilitation. Studies regarding the health-related QOL (HRQOL) of these patients with TBPI are limited in the literature from South India, particularly Kerala.

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The scope of the present study is to provide a baseline data on the disability due to brachial plexus injury and its influence on QOL and its various domains of QOL (physical, psychological, social, and environmental domains of QOL).

## MATERIALS AND METHODS

A descriptive cross-sectional questionnaire survey was conducted in a tertiary care center in the government sector in Kerala after obtaining the Institutional Ethical Committee clearance. A purposive sampling method was used. Patients with varying degrees of TBPI who attended the plastic surgery outpatient clinic between January 2018 and May 2019 were included in the study. Those patients below the age of 15 years, with a duration of injury of <4 weeks, with non-traumatic etiologies, and with other associated injuries such as head injury, abdominal injury, chest injury, spine injuries, and long bone injuries, were excluded from the study. All the data were collected by the principal investigator herself. After getting an informed written consent, the patient demographic details were entered in a pro forma. The clinical examination and assessment of disability were done as per revised guidelines for the evaluation of the permanent physical impairment – the Gazette of India, published by authority, New Delhi, 2001, reproduced in the interest of PWDs – National Institute for the Orthopedically Handicapped, Kolkata. For the sake of interpretation, the total disability score (0–100%) was categorized into three groups: Mild (0–25%), moderate (26–75%), and severe (76% and above).

The Malayalam translated version of the WHO BREF QUESTIONNAIRE (validity-Cronbach's alpha = 0.86)<sup>[6]</sup> was given to the patient. The patient himself or with the assistance of the bystander was directed to fill the questionnaire. The total QOL score of 400 was categorized into very good (301–400), good (201–300), poor (101–200), and very poor (0–100).

The association between categories of disability and categories of HRQOL was ascertained using non-parametric Chi-square test. Fisher's exact test was applied when individual cells had <5 numbers (considering the rarity of clinical situation). Statistics were done using the Statistical Package for the Social Sciences software version 16 (Chicago Inc.).

## RESULTS

### Clinicodemographic profile of patients

The total number of patients included in the study was 41 and all the patients were males. The mean age of the patients was  $36.8 \pm 14.4$  years ranging from 16 to 60 years. Majority of patients ( $n = 13$ , 31.7%) were in the age group of 26–35 years.

Twenty-four patients (58.5%) were married. Regarding the employment status, 23 patients (56%) were unemployed and 11 patients (26.8%) had permanent job while the rest ( $n = 7$ , 17%) had temporary job. The mode of injury was road traffic accident in majority of patients ( $n = 37$ , 90.2%) while rest had sustained the injury due to fall from height. Twenty-two patients (53.7%) had their dominant upper limb affected. The duration of injury of patients ranged from 3 months to 36 months (mean duration =  $16 \pm 10.2$  months). Twenty-one patients (51.2%) had pan-plexus injury, 11 patients (26.8%) had upper plexus, and the rest had lower plexus injuries. Twenty-one patients (51.2%) complained of neuropathic pain after the injury [Table 1].

### Disability scores of patients

The mean total disability of the 41 patients was calculated as  $80.39 \pm 13.86\%$  (minimum was 46.5% and maximum was 94%). Majority of patients ( $n = 26$ , 63.4%) had moderate disability. Four patients (9.8%) had mild disability while 11 patients (26.8%) had severe disability [Table 2].

**Table 1:** Demographic profile of patients with TBPI.

Variable	Frequency (n=41)	Percentage
Age of patients in years		
15–25	10	24.4
26–35	13	31.7
36–45	7	17
46–55	4	9.8
56–65	7	17
Mode of injury		
RTA	37	90.2
Fall from height	4	9.8
Dexterity of hand		
Dominant hand	22	53.7
Non-dominant hand	19	46.3
Duration of injury		
<6 months	7	17
6 months–1 year	17	41.5
More than 1 year	17	41.5
Type of brachial plexus injury		
Pan-plexus	21	51.2
Upper plexus	11	26.8
Lower plexus	9	22

HRQOL: Health-related quality of life

**Table 2:** The frequency of each category of total disability following brachial plexus injury.

Disability	Frequency	Percent
Mild	4	9.8
Moderate	26	63.4
Severe	11	26.8
Total	41	100.0

## QOL of patients

Among the 41 patients with brachial plexus injury, mean overall QOL score was  $188.46 \pm 83.44$  out of the total score 400. Minimum score was 57 and maximum score was 307. Mean QOL score in terms of physical, psychological, environmental, and social codomains was  $41.63 \pm 13.86$ ,  $44.78 \pm 20.66$ ,  $49.63 \pm 20.26$ , and  $54.24 \pm 23.59$ , respectively. On categorizing, 41.5% ( $n = 17$ ) had poor, 26.8% ( $n = 11$ ) had very poor, 17.1% ( $n = 7$ ) had good, and 14.6% ( $n = 6$ ) had very good total QOL [Table 3].

## Inferential statistics

The association between each categories of disability and the categories of HRQOL was ascertained using non-parametric Chi-square tests and was found that the disability following TBPI significantly reduced the HRQOL (Fisher's exact  $P = 0.005$ ) [Table 4].

Scatter plot delineated an inverse relation between disability and HRQOL indicating that as the disability increases, there is decrease in the HRQOL [Figure 1].

On analyzing the box plot charting the BREF score versus dexterity and the side of the upper limb affected, it was found that the involvement of dominant upper limb significantly reduced the QOL in patients with TBPI ( $P < 0.001$ ) [Figure 2].

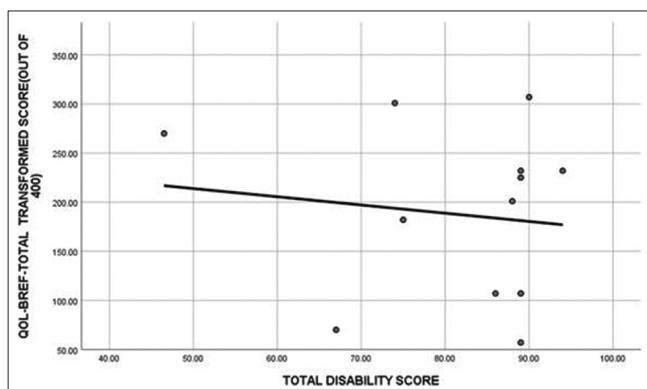
Pan-plexus injuries had a reduced score of QOL (BREF score = 34.8/100) as compared to the scores of the upper plexus

**Table 3:** The categories of total BREF score of quality of life.

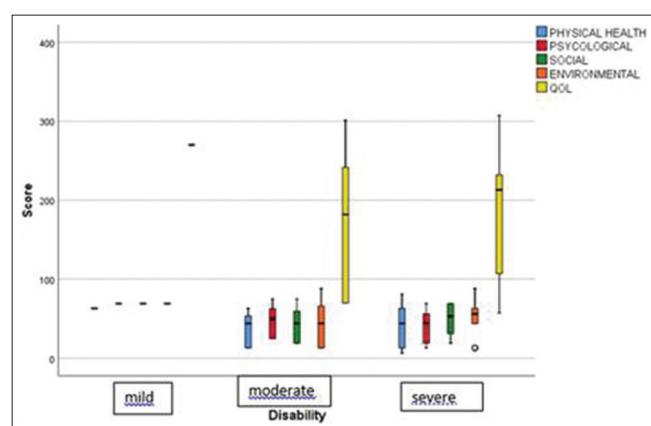
Quality of Life	Frequency	Percent
Very good	6	14.6
Good	7	17.1
Poor	17	41.5
Very poor	11	26.8
Total	41	100.0

and lower plexus injuries (mean scores = 50.9 and 46.3). It was also seen that patients with neuropathic pain had significantly reduced QOL (mean QOL = 23.3,  $P < 0.001$ ).

Among the codomains of the HRQOL, the psychological domain was the most affected domain, as shown by a significant  $P = 0.017$  (Kruskal-Wallis test).  $P$ -values of



**Figure 1:** Scatter plot showing an inverse relation between health-related quality of life and total disability.



**Figure 2:** Box plot showing relation between each domain of health-related quality of life and disability.

**Table 4:** Relationship between quality of life among patients with brachial plexus injuries with respect to total disability.

Total disability	HRQOL				Total
	Very poor	Poor	Good	Very good	
Mild	0	4	0	0	4
Moderate	7	13	3	3	26
Severe	4	0	4	3	11
Total	11	17	7	6	41
Chi-square tests					
Test	Value	df	Asymptotic significance (two sided)		Exact sig. (two sided)
Pearson Chi-square	15.273	6	0.018		0.016
Fisher's exact test	14.692				0.005

HRQOL: Health-related quality of life

**Table 5:** Significance of relation between various domains of HRQOL and disability.

Test	Physical health	Psychological	Social	Environmental	QOL
Kruskal-Wallis H	4.056	8.096	3.849	4.486	5.157
df	2	2	2	2	2
P	0.132	0.017	0.146	0.106	0.076

QOL: Quality of life, HRQOL: Health-related quality of life

physical, social, and environmental codomains were 0.132, 0.146, and 0.106, respectively [Table 5].

On analyzing the relationship of various demographic variables with total HRQOL, it was found that those patients in the productive age group (26–55 years) had significantly reduced QOL as compared to the extreme age groups ( $P = 0.000$ ). Employment status had a significant positive impact on the QOL as seen by a higher total BREF score for those with a permanent/temporary job than the unemployed ( $P = 0.024$ ). Marital status was found to have no significant relationship with the total HRQOL ( $P = 0.647$ ). Those belonging to the poor socioeconomic strata (below poverty line) had poor HRQOL as compared to those above poverty line (APL) and the relationship was found to be significant ( $P = 0.000$ ) [Table 6].

## DISCUSSION

Brachial plexus injury is a traumatic event leading to chronic disability. Adult brachial plexus injuries mostly occur following accidents such as road traffic accidents or injuries due to fall from height or penetrating injuries. In our study, majority of the patients were young males who had sustained the injury following road traffic accidents which were concordant with the epidemiological study conducted by Jain *et al.*<sup>[1]</sup> in 2012.

### Importance of psychological domain of QOL

Wellington, in 2010, found that the inability to work and perform activities of daily living greatly affected the psychological well-being of the individual.<sup>[7]</sup> Gray, in 2015, found that majority of the patients in his study group with TBPI reported negative experiences in their thought process.<sup>[8]</sup> They suggested the need for exploration in the psychological domain in these affected individuals. In our study, we found that the disability caused by the brachial plexus injury affected all four domains of QOL but the most significantly affected domain was the psychological domain. This finding points more toward the need for the psychological support and counseling sessions in the rehabilitation of these patients in addition to the surgical and physiotherapy treatments for the injury. The financial circumstances strongly influence the QOL as evidenced by better QOL with employed persons in the APL group. Hence, the development of self-help groups,

**Table 6:** Relationship of various demographic variables and total HRQOL.

Demographic variable	n	QOL-BREF – Total score		P
		Mean	SD	
Age categories				
15–25	10	167.0	96.6	0.000
26–35	13	225.4	47.1	
36–45	7	253.7	20.3	
46–55	4	70.0	0.0	
56–65	7	153.0	89.8	
Employment status				
Permanent job	11	243.3	21.4	0.024
Temporary job	7	190.1	10.2	
Unemployed	23	161.7	100.9	
Socioeconomic status				
APL	13	258.8	33.5	0.000
BPL	28	155.8	79.5	
Marital status				
Unmarried	14	171.3	80.7	0.647
Married but separated	3	201.0	0.0	
Spouse not working	16	210.4	81.2	
Dexterity				
Dominant hand	22	128.5	62.1	0.000
Non-dominant hand	19	257.8	38.8	
Type of plexus injury				
Pan-plexus	21	161.7	92.9	0.106
C5, C6 upper	11	219.2	41.1	
C8T1 lower plexus	9	213.3	85.2	

QOL: Quality of life, HRQOL: Health-related quality of life

vocational rehabilitation programs, and community-based rehabilitation groups are strongly recommended for these patients. These might help in improvement of the QOL of these patients and, in turn, make them more compliant to the various surgical and prolonged physiotherapeutic regimes which are inevitable for the optimal outcome of the treatment. This aspect is grossly overlooked in the current treatment protocol of TBPI. In our study, it was also seen that those with pan-plexus injuries and involvement of the dominant upper limb had poor QOL as compared to others. As the injured patients are mainly in the productive age group males who are the bread winners of the family in our community, the importance of vocational rehabilitation emphasizing on the usage of non-dominant hand and support groups cannot be underestimated.

## Limitation

The study needs to be conducted as a multi-institutional study with larger sample size to get a vivid picture of all the associated factors which affect the HRQOL of these patients.

## CONCLUSION

TBPI significantly affected all domains of QOL, especially in unemployed patients in the productive age group in the poor socioeconomic strata. The pan-brachial plexus involvement of the dominant upper limb and associated neurological pain were the most important factors which negatively affected the QOL. Among the codomains of the QOL, psychological domain was found to be most significantly affected and it was found to be affected irrespective of the severity of the injury.

The results of the study helped in identifying the need for early psychological interaction which will ultimately provide improved patient compliance to the various treatment modalities that may be offered for the optimal outcome. The need for vocational rehabilitation of these patients by training the patient to use the unaffected limb for his activities of daily living might play a key role in the improvement of the HRQOL. The improved QOL of the life of the patient might also lead to the positive belief and attitude change of the family members and society to the disabled individuals.

Our study highlights the less explored areas of QOL of patients with TBPI and would provide baseline data for future experimental research, relevant for the health policy-making in our state as well as in India.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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