

DETERMINANTS OF QUALITY OF LIFE AMONG UPPER LIMB PROSTHESIS USERS PAKISTAN: A MULTICENTER STUDY

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ABSTRACT

Objective: To determine the quality of life among users of upper extremity prosthesis.

Study Design: Cross sectional study.

Place and Duration of Study: Day's Medical Engineering and Artificial Limbs Center Multan and Pakistan Institute of Prosthetic and Orthotic Sciences, Peshawar, Pakistan, from Jul to Dec 2018.

Methodology: A sample population of 276 users of upper extremity prosthesis was recruited employing convenience sampling including both genders aged 20-50 years. Demographic sheet, 36- Item Short Form Health Survey (SF-36) and Quick Disabilities of the Arm, Shoulder and Hand questionnaire (Quick-DASH) were used to collect data followed by analysis using SPSS-22.

Results: Mean score on Quick Disabilities of the Arm, Shoulder and Hand questionnaire was 49.2±25.4. The mean scores of 36- Item Short Form Health Survey revealed highest values in the domains of emotional wellbeing (55.8 ± 17.7) and energy/fatigue (54.0 ± 14.3) while lowest values were noted in the role limitation due to emotional problems (38.9 ± 33.5) and General Health (43.8 ± 19.6) domains.

Conclusion: The study findings concluded that the overall quality of life of upper limb prosthetic user was low along with significant association of demographic features with SF-36 and Quick DASH.

Keywords: Amputation, Prostheses, Quality of life, Upper extremity.

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INTRODUCTION

Amputation can be defined as the surgical or traumatic removal of a body extremity and rated as one of the most common acquired disabilities,¹ with an incidence of 46.1 to 9600 per 10 (5) population around the world.² The prevalence of upper limb amputation falls at 3%.³ Amputation results in significant structural, physiological, and psycho-social impact that can change the quality of life of these patients.¹ In addition, it can be related with anxiety, depression and separation, changing the social roles and free time activities of an individual.

Amputation can result in the upper or lower limb deficiency and at different levels. Significance of hands and arms has been stressed by a number of authors, since loss of hand and arm result in loss of qualitatively different set of skill, compared to the loss occurring from lower limb amputation with different reasons like importance of hand and arm in actions of daily activities which are essential for living like holding items, gesturing as well as physical contact.⁴ Upper limb amputations can be classified into below elbow

including trans-carpal, forearm amputations and wrist disarticulations; and above elbow amputation include trans-humeral, forequarter amputations and shoulder disarticulations.⁵ Probable causes of upper limb amputation include trauma, vascular cause, tumors, infection and congenital anomalies.⁶ According to Ostlie *et al.* amputations of upper limb usually occur because of a specific "traumatic injury".⁷

Daily life activities including quality of life (QoL) have proved to be significantly compromised in amputees. In a study, Revicki *et al.*,⁸ puts QoL as a wide range experiences in human being's life which are linked to his general feeling of wellbeing. It includes values related to a person's expectations of functioning defined by states, perceptions and individuals' experiences which are subjective in nature. According to Desmond and Gallagher though the concept of QoL in the field of amputation and prosthetics has been scarcely researched, however importance of its assessment has been acknowledged in client-centered evidence based practice.⁹ Consensus on the definition of QoL is still contentious with no gold standard for its measurement. However, assessment of benefits of an intervention for amputees can be seen as its effect on health-related QoL of an amputee. Using and adapting to a prosthetic limb

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with increasing physical activity, may lead to changes in an amputee's physical abilities and will likely influence self-reported Qol.¹⁰ Hence, this study is of utmost importance, keeping in view the significance of Qol in upper extremity amputees, a high prevalence rate and lack of local literature. Therefore, this research was done to determine the Qol among users of upper extremity prosthesis.

METHODOLOGY

This was a cross-sectional study. Sample population of either gender, aged 20-50 years was recruited using convenience sampling from Day's Medical Engineering and Artificial Limbs Center, Multan; and Pakistan Institute of Prosthetic & Orthotic Sciences, Peshawar, Pakistan (PIPOS), from July to December 2018. Rao soft calculator was used to calculate sample size with a confidence level of 95% and margin of error of 5% taking a population size of 20, (000 with 50% response distribution.

Inclusion Criteria: Upper limb amputees using prosthetic devices were included.

Exclusion Criteria: Bilateral amputees, Partial hand amputees; amputees with cognitive issues and any systemic illnesses and Orthosis users were excluded.

Following ethical approval of Institutional Research Board Isra University, (vide Registration No. 1609-M.Phil P & O-002) dated 6th June 2018, and informed consent amputees were subjected to data collection using demographic sheet. This was followed by assessment of disability using Quick Disabilities of the Arm, Shoulder and Hand questionnaire (Quick-DASH) followed by quality of life (QOL) measurement using 36-Item Short Form Health Survey (SF-36) questionnaire. Data was collected from upper limb prosthetic users through questionnaires by certified Prosthetists and Orthotists.

Quick DASH is an 11-item questionnaire to assess the ability to perform upper extremity functions. This self-report measures scores functions on 5 point linkert scale. While SF-36 is a health related Qol questionnaire which has 36 items in 8 domains both physical and mental with a composite score ranging from 0-100. Mean score of normal general population is 50+10 and a higher score indicates better Qol.

Following collection of data of upper limb prosthesis users by certified prosthetists and orthotists the data was analyzed by using Statistical Package for the social sciences (SPSS) version 22 and Ms Excel version 2016 software descriptive statistic were used including

frequency, percentage, mean ± SD. Pearson's correlation was noted for domains of SF-36 with DASH. The p-value of ≤0.05 was taken as significant.

RESULTS

Study sample (n=276) comprised 230 (83.3%) males and 46 (16.7%) females and mean age was 29.5 ± 12.5 years. Most of the participants were educated up to higher secondary school (HSC) level i.e. 182 (65.9%), followed by 54 (19.6%) who were above HSC. The most common single cause of amputation was accidents in 119 (43.1%) causes. Most common amputation level was through radius (196, 71%), followed by through humerus (47, 17%), wrist disarticulation amputation (19, 6.9%) and 12 (4.3%) shoulder disarticulation amputation and 2 (0.7%) were amputee of elbow disarticulation (Table-I).

Table-I: Frequency of demographic variables of quick DASH & SF-36 (n=276).

Variables	Categories	Indifferent Columns, n (%)
Age Groups	20-30 Years.	161 (58.3%)
	31-40 Years.	60, (21.7%)
	41-50 Years.	55 (19.9%)
Gender	Male	230 (83.3%)
	Female	46 (16.7%)
Marital Status	Married	78 (28.3%)
	Unmarried	198 (71.7%)
Education level	<HSC	182 (65.9%)
	>HSC	54 (19.6%)
Occupation	Illiterate	40 (14.5%)
	Businessman	37 (13.4%)
	Driver	8 (2.9%)
	Govt. Servant	36 (13%)
	House Wife	15 (5.4%)
	Laborer	43 (15.6%)
	Ex-Govt. Employee	5 (1.8%)
	Self-Employed	33 (12%)
	Student	58 (21%)
Causes	None	41 (14.9%)
	Peripheral Vascular Disorder 1 (0.4%)	
	Diabetes	3, (1.1%)
	Accident	119 (43.1%)
Amputation Level	Other	153, (55.4%)
	Elbow Disarticulation	2, (.7%)
	Shoulder Disarticulation	12, (4.3%)
	Through Humerus	47, (17%)
	Through Radius	196, (71%)
	Wrist Disarticulation	19, (6.9%)

The mean Quick DASH score was 49.2 ± 25.3. As regards SF-36, the highest values were found in the domains of emotional wellbeing (55.8 ± 17.6) and energy/fatigue (54 ± 14.3), while the lowest values were noted for domains of role limitation due to emo-

tional problems (38.9 ± 33.4) and General Health (43.8 ± 19.5), Association of demographic variable with SF-36 and quick DASH was noted for pain domain of SF-36 which had significant correlation with occupation, The correlation of quick DASH with all eight domains of SF-36. Moderate negative correlations were found between Quick DASH and domains of physical functioning ($r=-0.268$, $p<0.01$), pain ($r=-0.404$, $p<0.01$) and general health ($r=-0.401$, $p<0.01$) and weak correlation with other domains of SF-36 shown in Table-II.

Table-II: Pearson's Correlation Matrix. Descriptive Statistics (Mean and SD) and Correlation of Quick Disabilities of the Arm, Shoulder and Hand questionnaire with Domains of 36-Item Short Form Health Survey.(n=276)

Inventory	Domain	Mean \pm SD	Correlation	
			r-value	p-value
Quick DASH	Total	49.2 \pm 25.4		
36-Item Short Form Health Survey	Physical functioning	47.7 \pm 29.7	-0.268**	<0.01
	Role physical health	46.9 \pm 40.2	-0.166**	0.006
	Role emotional problems	38.9 \pm 33.5	-0.087	0.152
	Energy/fatigue	54 \pm 14.3	-0.095	0.117
	Emotional well being	55.8 \pm 17.7	0.009	0.887
	Social functioning	48.5 \pm 25	-0.190**	0.002
	Pain	48.4 \pm 32.9	-0.404**	<0.01
	General health	43.9 \pm 19.6	-0.401**	<0.01

Note: $r>0.50$ = strong correlation, $r=0.30$ = moderate correlation, and $r<0.20$ = weak correlation).

DISCUSSION

Prosthetic devices for the upper extremities are a technically difficult area since such prosthesis are expected to reproduce complex and delicate movements and hence such amputees may experience frustration and problems along with getting accustomed to the process of rehabilitation. However, recently development of prosthetic limbs using electronic technologies like myoelectric devices have taken place, the weight, lack of precision and speed in movements, are resulting in substantial glitches.¹¹ However Michiro *et al*, in their study reported that Qol was much higher in prosthesis users compared to non-users and statistically significant differences were reported.¹²

In the current study high values of SF-36 mean domain scores were noted for emotional wellbeing (55.8 ± 17.6) and energy/fatigue (54 ± 14.3), followed by social functioning, pain and physical functioning indicating less disability and better Qol while the lowest values were noted for the domains including

role limitation due to emotional problems (38.9 ± 33.4) and general health (43.8 ± 19.5) indicating more disability and lowered Qol. In addition, a mean score of Quick DASH of 49.2% was found indicative of low to moderate quality. Similarly in a study by Resnik *et al*, in upper limb amputees using body-powered devices mean score of Quick DASH was reported at 49.5.¹³

The present study showed a predominance of male, unmarried population with educational level of HSC and mean age of 29.5 ± 12.5 years. Results show association of demographic variable with SF-36 and Quick DASH (table1). For the pain domain of SF-36 significant correlation with age and occupation and education was noted. In addition, there was a significant relationship of age with 4 SF-36 domains including physical and social functioning, pain and general health. In addition, significant relationships were noted for domains of limitation of role because of physical function and emotional problems with cause of amputation; domain of emotional wellbeing with marital status, education and amputation level; and domain of general health with age, education, occupation, and level of amputation; and quick DASH with age, marital status, occupation, cause and level of amputation. Similarly, in other studies, statistically significant difference between Qol score and demographic variables has also been reported for age,¹⁴ gender, level of amputation, education level,¹⁵ etiology, and specially level of amputation affected the use of prosthesis.¹⁶ In this connection, Biddiss & Chau, in study on upper limb amputees reported abandoning of prosthesis in 20% of cases with predisposing factors being limb absence bilaterally, origin of limb absence, gender and level of amputation being most important.¹⁶

Upper extremity functions significantly impact Qol both at physical and mental levels of an amputee.¹⁷ In the current study correlation of Quick DASH with all eight domains of SF-36 was noted with moderate negative correlations between the domains of physical functioning (-0.268), pain (-0.404) and general health (-0.401) and weak correlation with other domains of SF-36. In addition, the correlation of Quick DASH with all the variables of SF-36 was significant ($p<0.05$) except for domain of limitation of role because of emotional issues. While Nevena and Sanja reported statistically significant correlation of Quick DASH with role physical, role emotional, bodily pain and physical composite summary ($p<0.01$).¹⁷ Also in another study by Atroshi *et al*, a positive correlation of Quick DASH scores with the SF-12 scores was reported with a

stronger correlation with the physical than with the mental health component.¹⁸ In an Egyptian study by Mohammed and Shebl to assess the QoL in limb amputees revealed changes with significant difference of QoL with variables of gender, age, level of education and work type.¹⁵ Furthermore, scores were higher for males compared to females in the roles of physical functioning and emotional role.¹⁵

Better prosthetic systems may be helpful to improve patient acceptance, satisfaction & QOL. So much so that rejection rate of 45% and 35% in children and 26% and 23% in adults for body-powered and electric-powered prosthesis was noted 19 also users in spite of having a myoelectric limb rely on intact limb 20, though the QoL is affected in amputees.¹⁷

In a review article, Cordella *et al*, pointed out the requirements of future prosthetic systems, which should be met for patient satisfaction. According to them the prosthesis should allow daily life task execution and include grasping and manipulation procedures; it should have tactile sensory system and control system which should help in daily activities like feeding, cleaning and dressing activities.²¹ It was reported in an Indian study that major design priorities of patients were comfort, functionality and durability. Furthermore, provision of subsidy, early provision and fitting facilitate long-term prosthetic use and improve rate of acceptance.²²

CONCLUSION

The study findings concluded that the overall quality of life of upper limb prosthetic users was low along with significant association of demographic features with SF-36 and Quick DASH. Pain was associated with age and occupation; age with physical and social functioning, pain and general health; limitation of role because of physical function with cause of amputation; emotional wellbeing with marital status, education and amputation level; general health with age, education, occupation, and level of amputation; and quick DASH with age, marital status, occupation, cause and level of amputation.

Conflict of Interest: None.

Authors' Contribution

FS: Data collection, analysis & Interpretation, NM: Conception of work & critical revision, GS: Manuscript writing and literature review.

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