



UTILIZATION OF PROSTHESIS IN LOWER LIMB AMPUTEES -A CROSS SECTIONAL STUDY

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ABSTRACT

Introduction-Amputation is the surgical removal of a part or whole of a limb. It is the last treatment option in limbs, which are not salvageable or when the diseased limb poses a threat to the life of the patient. Lower limbs have loco motor function and functionless lower limb will interfere with the normal living of the patient which causes a considerable economic, social and psychological impact on the patient's quality of life. This study was undertaken to assess the bio-social characteristics and clinical profile of lower limb amputees attending tertiary care rehabilitation centre and to determine the factors affecting the utilization of prosthesis in lower limb amputees.

Material & Methods- An observational cross-sectional study was conducted on 124 lower limb amputees attending the day care facility of department of PM &R, K.G.M.U, Lucknow. Non-random purposive sampling was done and all patients with unilateral lower limb amputation were enrolled after taking informed verbal consent. Biosocial characteristics were collected and history of amputation was taken and physical examination was done.

Results-Two-third of the lower limb amputees were males (66.1%) and similar number of them had Transtibial amputations (66.1%) which is observed to be the most common type of amputation. Trauma is the most common cause of Lower Limb Amputations (64.5%). Residual limb pain was the main presenting complaint (83.4%) and only 61.3% of them were using prosthesis. Age of 30-40 years (AOR 4.408;95% C.I. 1.936-10.036; P=0.0001), sex female (AOR 5.895,95% C.I. 1.837-18.924; P=0.001) and employed (AOR 10.985; 95% C.I. 3.688-32.718) showed increased utilization of prosthesis after the multivariate analysis.

Conclusion- The lower limb amputees should be encouraged to use rehabilitative prosthetic devices so that they can maintain a good quality of life.

Key words – Lower limb amputees (LLA), prosthesis, utilization, Rehabilitation

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INTRODUCTION

Amputation is the loss of one or both limbs following severe injury, disease or surgery¹. It is indicated when the limb is not salvageable and is dying or dead, thereby posing a threat to patient's life, or it is viable but functionless². Trauma is the leading cause of leg amputation in developing countries and is second only to peripheral arterial

disease in developed countries³. Lower limbs have loco motor function and amputation of lower limbs will have a significant impact on the physical, social and psychological health of the patient, thereby leading to permanent disability in them and a considerable deterioration in their quality of life². The disability following a lower limb amputation is both profound and prolonged;

and is a major predictor of poor health outcomes. Hence the main aim of this study was to assess the clinical profile and biosocial characteristics of lower limb amputees so that satisfactory and easily utilizable rehabilitative prosthetic devices can be given to them in order to improve their quality of life. This study was undertaken to assess the Bio-social characteristics and clinical profile of lower limb amputees attending a tertiary care rehabilitation centre and to determine the factors affecting the utilization of prosthesis in lower limb amputees.

MATERIAL & METHODS

Study setting: Department of PM&R, K.G.M.U., Lucknow

Study Design: Observational cross-sectional study

Study Period: 6months

Sample size: Non-random purposive sampling (convenient sampling)

Inclusion criteria:

- 1) All cases of unilateral lower limb amputees attending the day care facility of PM&R department, K.G.M.U, Lucknow
- 2) Those who agreed to participate in the study

Exclusion criteria:

- 1) Bilateral lower limb amputees
- 2) Not willing to participate in the study

Data collection: 124 patients who were willing to participate in the study and fulfilling the inclusion criteria were enrolled after taking informed verbal consent. Biosocial characteristics of the patient were collected and history of amputation was taken and physical examination was done. Ethical clearance has been taken from institutional review board, K.G.M.U, Lucknow.

Operational definitions:

Prosthesis Users – Those who are using prosthesis from 8 weeks onwards from the day of amputation for at least 8 hours a day till the day they attended the OPD with complications.

Prosthesis Non-Users – Those who have not used prosthesis till the day of attending OPD or use it for less than 8 hours a day or have discontinued its use for the last 1 month.

Data analysis: Data analysis was done using SPSS version 23. Descriptive statistics were calculated for demographic and clinical characteristics. Cross-tabulations were used to

summarize the different factors as per the use of prosthesis. Chi square test was used to analyse the influence of age, sex, employment status, cause and type of amputation on utilization of prosthesis. P value < 0.5 was taken as significant. All those factors which were significant by chi square test were subjected to binomial multivariate regression analysis for determining the true correlates after elimination of confounding factors.

RESULTS

In this study, two-third of the patients attending the rehabilitation centre were males (66.1%) and mean age of the patients was 40.3 ± 7.8 years. Majority of the patients were employed; still approximately 31% patients were unemployed. The mean time since amputation was 10 ± 4.5 months. Trauma (64.5%) is the most common cause of lower limb amputation while tumour is the least. Transtibial (66.1%) is the most common type of amputation while maximum patients presented with residual limb pain (83.1%). Only two-third (61.3%) patients were using prosthesis while 38.7% were still not using it. [Table 1]

Use of prosthesis is a major source of rehabilitation in amputees. The main aim of this study was to explore all those factors at the level of the individual, which hinder prosthesis use in a lower limb amputee. Analysis was done by binomial multivariate logistic regression test so as to eliminate the confounding factors which can affect the desired results. It was observed that majority of patients in the age group of 30-40 years were using prosthesis while minimum use is by the elderly age group (40-60 years). Age is a significant factor which affects the use of prosthesis ($P < .001$). Gender was also found to be a significant factor ($P < .001$) and clearly it is seen that females don't use prosthesis much which further converts the disability into handicap. All employed lower limb amputees showed good prosthesis use which indicates this as an important factor predicting the use as its value is highly significant ($P < .001$). Cause of amputation ($P < .001$) was also observed to be significantly associated with use of prosthesis. [Table 2]

After analysing the data by binomial multivariate logistic regression only age, sex and employment status was observed to affect the utilization of

prosthesis in lower limb amputees. The use of prosthesis is 4.4 times more likely to be seen among lower limb amputees of age 30-40 years as compared to 50-60 years individuals. Similarly, the utilization is 5.9 times more in the males as compared to the females. Employed lower limb amputees have predicted a ten times more utilization of prosthesis in comparison to the unemployed. [Table 3]

Table 1: Characteristics of Lower Limb Amputees (N=124)

Characteristics		No.	%	Mean ±S.D.
Age(years)		124		40.3±7.8
Gender	Male	82	66.1	
	Female	42	33.9	
Employment status	Employed	86	69.4	
	Unemployed	38	30.6	
Time since Amputation (months)		124		10±4.5
Cause of amputation	Trauma	80	64.5	
	Vascular	26	21.0	
	Diabetes mellitus	16	12.9	
	Tumors	2	1.6	
Type of amputation	Trans tibial	82	66.1	
	Transfemoral	22	17.7	
	Knee disarticulation	10	8.1	
	Ankle disarticulation (Symes amputation)	8	6.5	
	Others	2	1.6	
Presenting complaints	Residual limb pain	103	83.1	
	Phantom limb sensation	99	79.8	
	Phantom limb pain	86	69.4	
	Residual limb with discharging sinus	76	61.3	
	Residual limb deformity	58	46.8	
	Bony overgrowth	40	32.3	
Prosthesis Use	Using prosthesis	76	61.3	
	Not using prosthesis	48	38.7	

Table 2: Distribution of Factors in Lower Limb Amputees on the Basis of Utilization Of Prosthesis (N=124)

Parameters		Prosthesis Users	Prosthesis Non-Users	P Value
Age (years)	30-40	54 (77.1%)	16 (22.9%)	< .001*
	40-50	18 (42.9%)	24 (57.1%)	
	50-60	4 (33.3%)	8 (66.7%)	
Sex	Males	60 (73.2%)	22 (26.8%)	< .001*
	Females	16 (38.1%)	26 (61.9%)	
Employment Status	Employed	68 (79.1%)	18 (20.9%)	< .001*
	Unemployed	8 (21.1%)	30 (78.9%)	
Causes of Amputations	Trauma	48 (60%)	32 (40%)	< .001*
	Vascular	10 (38.5%)	16 (61.5%)	
	Diabetes Mellitus	16 (100%)	0 (0 %)	
	Tumor	2 (100%)	0 (0 %)	
Type of amputation	Trans tibial	48 (58.5%)	34 (41.5%)	0.063
	Transfemoral	14(63.6%)	8 (36.4%)	
	Knee disarticulation	6(60%)	4 (40%)	
	Ankle disarticulation (Symes amputation)	8(100%)	0 (0%)	
	Others	0 (0)	2 (100%)	

*Highly significant (P<.001) after Chi square test.

Table 3: Multivariate Regression Analysis of Factors Affecting the Utilization Of Prosthesis In Lower Limb Amputees (N=124)

Predictors		Adjusted Odds Ratio	95% CI		P Value
Age (years)	30-40	4.084	1.936	10.036	< .001
	40-50	2.001	1.803	12.592	0.004
	50-60	Ref	-	-	-
Sex	Males	5.895	1.803	12.592	0.004
	Females	Ref	-	-	-
Employment Status	Employed	10.985	3.688	32.718	< .001
	Unemployed	Ref	-	-	-
Cause of amputation	Trauma	1.71	0.351	3.916	0.797
	Others	Ref	-	-	-

DISCUSSION

Lower limb amputation is an adverse event in the life of an individual. It has an emotional, psychological, physical and social impact on the patient's life. In no time the impairment converts into disability and finally the patient feels handicapped. Although the loss of lower limb is itself a major toll on the life of the amputee, lack of awareness about various rehabilitation facilities further adds to his agony. Various prosthetic devices are available for lower limb amputees so as to give them adequate locomotion thereby

improving their quality of life. Thus, it is very essential to identify all those factors which affect the use of prosthesis in lower limb amputees at the level of individual. Lower limb Amputees are a very neglected and vulnerable group of the society. Sometimes they are even looked down upon and are considered to be incapable of doing anything. After a Unilateral lower limb amputation, the quality of life can be maintained with a good rehabilitation programme whose one of the main component is use of prosthesis. Very few studies have been conducted in this regard, major reason being the lack of mobilisation of these patients to rehabilitation centres after the amputation as they themselves develop a negative approach towards life. In a study by Jadeja B⁴ et al (2016) in Jaipur, trauma (81%) was found to be the most common cause of lower limb amputation which is similar to our study. This is attributed to the increase in road traffic accidents in last few years which is indirectly resulting in some form of disability (especially of lower limb) in post trauma survivors and need for prosthesis. This study also showed a male predominance among lower limb amputees and mean age was 39.7years which is close to the result of our study. Our results are also consistent with a similar study conducted by Pooja GD³ et al (2013) in kolkatta where trauma was observed to be the most common cause of lower limb amputation. Further in this retrospective study, majority of lower limb amputees were males (86%) and below knee amputation was the most common level. Nearly similar observation made by James Behr⁵ et al (2009) who reported primary causes of the limb loss was trauma (74%) followed by vascular disease (24%), gangrene (17%) and infection (12%). Mehreen M² et al (2015) in their prospective study of Jammu had observed that most of the lower limb amputations were traumatic. The study also reported peripheral vascular disease and diabetes as the second leading cause for lower limb amputations which is correlating to our results. Due to the silent epidemic of diabetes in developing countries, in future diabetes is likely to take over trauma as a predominant indication for lower limb amputation in the developing countries like India. Peripheral vascular diseases are also leading in developing countries because of increase incidence of poor quality cigarette

smoking(bidis) which predispose the individuals to Buerger's disease. Also, Transtibial amputation (66.67%) was common type of amputation followed by Transfemoral (22.78%), knee disarticulation (2.78%) and Syme's (2.78%). Similarly, Sinha R⁶ et al (2011) in their cross-sectional study in Mumbai also observed trauma as the leading cause of LLA while diabetes and peripheral vascular disease as the second leading cause thereby indicating a major shift in the trend of LLA causes. This study also documented that 52% of the study population (LLA) was unemployed which is more as compared to our study where only 30.6% were unemployed. This can be due to implementation of various government programmes in Uttar Pradesh, India for the disabled population. However, a lot has to be done for this vulnerable section of society. There are various factors which affect the utilisation of prosthesis in LLAs (lower limb amputees). These include sociodemographic factors, clinical profile, etiology of disease and psychosocial factors. We have observed that age, sex, employment status among the sociodemographic factors were determinant of prosthetic utilisation and cause of amputations among the clinical factors were observed to affect the usage. Our results are consistent with a study on prosthesis utilization by Raichle KA⁷ et al on Upper limb amputees and lower limb amputees in which they observed that demographic and medical predictors of prosthesis use vary by amputation site (i.e., upper or lower limb). In particular, factors related to greater use (in hours per day) in persons with LLA included being younger, being employed, being married, having a distal amputation, and having an amputation of traumatic etiology. In comparing those with ULA (upper limb amputation) versus LLA (lower limb amputation), LLAs may present more challenging functional limitations, which are reflected in the greater use of a prosthesis overall. This possibility is supported by the fact that among persons with LLA, employment or active schooling (as opposed to retirement or disability) was associated with greater prosthesis use. Although in this study employed LLAs showed 5.88 times greater usage of prosthesis which is less than that observed in our study. This can be attributed to the purposive sampling technique

which has resulted in selection bias and is a limitation of our study. Similarly, Gagnon CG⁸ *et al* assessed the predisposing factors of prosthesis use in transtibial and transfemoral amputees and concluded that more subjects used their prosthesis to ambulate outdoors. However, it was noted that 65% of these persons were under 65 years of age, the age group that makes up the work force. The primary reasons for curtailed or limited use of the prosthesis indoors and outdoors expressed by people with lower-extremity amputations were walking with the artificial limb was too exhausting (29.0% in the house vs 35.3% outside); problems with the non-amputated leg (37.4% vs 38.8%); discomfort or perspiration problems from the prosthesis (36.1% vs 30.2%); and stump irritations or sores (28.4% vs 27.6%). Some of these reasons were also reported by Beekman and Axtell⁹. A person that had undergone a lower limb amputation will be greatly affected as they have lost the ability to mobilise and be independent. It is very essential to identify the cause so that early utilization of prosthesis can be resumed. However, complications during or after primary amputation leads to high morbidity, delay prostheses fitting and rehabilitation or may confine patients to wheelchairs. Very few studies have been conducted among amputees in North India so our study gives an incite of their lack of awareness for prosthesis utilization and paves a way for more similar studies on a larger disabled population.

CONCLUSION

The mean age of lower limb amputees in our study is 40.3±7.8 years which is the working age group. Trauma is the most common cause of amputation. Residual limb pain is the most common presenting complaint. In our study only 61.3% patients are using prosthesis. Almost two-third of the patients (30.6%) in this study are unemployed. This signifies that all those factors which affect the normal life of lower limb amputees should be identified and immediate appropriate measures must be taken to ameliorate them.

RECOMMENDATIONS

It is strongly recommended that all amputees should be encouraged to undergo a well-structured rehabilitation program which includes

physiotherapy, occupational therapy and vocational rehabilitation in order to improve their physical functioning and Quality of life. They should be encouraged more to use prosthesis and timely assessment of their utilization should be done. The rehabilitation team members, the government funding bodies, the employers must work together so as to facilitate job placement after amputation as early as possible.

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