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Physical Function Outcomes Following Rehabilitation of Patients with Unilateral Lower Limb Amputation

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Abstract

Background: Amputation is a devastating and life-threatening incident that leads to physical, socio-economical, and psychological confrontation.

Objectives: The study sought to determine the functional outcome after completing rehabilitation among unilateral lower limb amputation (LLA) patients.

Methods: The cross-sectional study was carried out from May to July of 2023. The convenience sampling technique was used to collect data from 149 patients with unilateral LLA who were receiving treatment at a tertiary hospital in Bangladesh. The Locomotor Capabilities Index (LCI), scale was used to measure the physical functioning of the survivors. The study was conducted using version 25.0 of the Statistical Package for Social Sciences (SPSS). The Spearman‘s test was done to analyze the correlation where the p-value was < 0.05, which seems as significant.

Results: The mean age ± SD of the participants was 33.09 ± 11.13. Out of 149 respondents, the majority (34.9%) were in the age range of 21 to 30 years. The majority of the respondents (81.2%) were males, 65.1% were unmarried, and 67.8% were from rural areas. Road traffic accidents (66.4%) are the major causes of injury where most of the amputation (45.6%) was done below the knee. There was a significant correlation between gender ($p = 0.014$) and current occupation ($p = 0.001$) with the score of LCI respectively. Further, a significant positive correlation was found between the use of prosthesis ($p = 0.014$) and the LCI total score of the respondents.

Conclusion: The results of the study revealed that patients with LLA reported considerable independence of physical functioning of the respondents with supportive aids.

Keywords: Amputation, Lower limb amputation, Functional outcome, Physical function.

Introduction

Amputation is simply the surgical removal of a full or partial limb to safeguard the remaining skin-covered components **[1]**. Lower limb amputation (LLA) is a permanent surgical method that can affect a person's everyday activities as well as their function **[2]**. LLA is a procedure having substantial anatomical, functional, psychological, and social implications that may affect patients' quality of life (QOL). A life-changing scenario arises as a result of lower limb surgery or removal **[3]**. People who have had below-level amputations have greater levels of physical functioning **[4]**. Diabetes is the leading cause of surgical amputations **[5]**. Peripheral vascular disease is the most frequent reason for amputation in developing nations. Research conducted in India found that trauma was responsible for 70.3% of amputations **[6]**.

Physical therapy is an essential part of being able to do functional tasks. Amputees must get instruction in order to perform some everyday tasks, such as self-care, mobility, transfer, balance, and exercises that they can perform independently **[7]**. The fundamental objective of rehabilitation is to improve quality of life and physical function independently **[8]**. Exercise is essential for the patient's post-amputation healing, as well as wheelchair and crutch mobility. Muscle development in both lower extremities is also necessary for patients to be able to do their daily tasks by themselves **[7]**. LLA has an impact on a person's mobility and ability to participate in a number of daily

activities. As a result, fewer individuals can walk and do everyday duties with prostheses in their homes and communities **[1]**.

According to most research, those who have had unilateral or distal amputations recover more and are better able to walk and do ADLs than those who have had bilateral or proximal amputations **[9]**. Rehabilitation, which focuses on recovering the patient's functioning and involvement in activities, as well as general health and psychological well-being, pain management, skin and stump care, and prosthesis fitting, is the most crucial responsibility after amputation **[10]**.

Mousavi et al. **[11]** estimated that one out of every 190 persons in the United States has lost a limb. The figure is predicted to more than quadruple by 2050 if present trends persist. Approximately 1.7 million individuals today live with amputations. According to a recent survey done in Kolkata, lower limb amputees constituted 94.8% of the population with amputations **[1]**. Amputation-related impairment has grown internationally in recent years. Many people who experience depression and anxiety following amputation refuse to seek therapy because they believe they are a burden to their families and society. In Bangladesh, there is no proof of amputation survivors' psychological well-being. However, the investigator believes that there are certain restrictions. There has been no meaningful study on this topic in Bangladesh yet. As a result, it is critical to investigate their psychological status and urge them to seek physical therapy treatment. The study sought to determine the socio-demographic profile and functional outcome among unilateral LLA patients.

Methodology

Study Design

Examining the physical and mental well-being of LLA patients in Bangladesh was the aim of this cross-sectional study. The convenience sample approach was utilized to gather information from 149 individuals. Patients with unilateral LLA were the study population who were receiving rehabilitation support from the prosthetics and orthotics department at the tertiary level hospital of the Centre for the Rehabilitation of the Paralyzed (CRP) in Dhaka, Bangladesh.

Study Population

The study was carried out in 2023 between May and July. In this study, the researcher additionally evaluated eligibility criteria, which assisted the researcher in selecting acceptable and relevant individuals for the study. Patients with unilateral LLA of both genders ranging in age from 15 to 70 years actively participated in this study and satisfied the eligibility requirements. Participants with mental and cognitive problems were excluded from the study, as did those who refused to participate.

Outcome Measurements

Data was gathered using a semi-structured questionnaire. The survey was created with consideration for the present investigation's features and aims. The questionnaire contained two fundamental elements. The first section included demographic and amputation-related data, such as age, gender, marital status, dwelling region, sources of injury, duration of amputation, side of amputation, level of amputation, and participant satisfaction. The researcher gathered information through an individual interviewing approach in a quiet setting.

In the second section, the Locomotor Capabilities Index (LCI) was utilized to assess the participants' physical functional level **[8,12]**. LCI was utilized to assess individuals' mobility levels and their ability to ambulate freely. It consists of 14 questions that measure persons' basic and advanced skills across five levels to determine their level of independence. Level 5 implies that an individual can conduct daily activities independently, even without the use of assistive technology, whereas level 1 shows that an individual is unable to complete daily duties even with the assistance of another person **[13]**.

Data Analysis

Microsoft Office Excel 2013 and the Statistical Package for Social Sciences (SPSS) version 25.0 were used to data input and analyze the gathered data. The chi-square test was utilized to ascertain the degree of significance between two or more variables. Continuous data were displayed as mean and standard deviation (SD), while categorical variables were displayed as percentages and frequencies. At the $p < 0.05$ analytical level, the null hypothesis was excluded.

Ethical Approval

The World Health Organization (WHO), Bangladesh Medical Research Council (BMRC), and Centre for the Rehabilitation of the Paralyzed (CRP) have had their ethical standards met. Patients were fully described about the study's goals and methodology before participation, and they completed an informed consent form. The project was approved by administrative bodies from the Bangladesh Health Professions Institute's (BHPI) CRP ethical committee and the Institutional Review Board. The registration number is: CRP/BHPI/IRB/03/2023/704.

Results

In this observational study, one hundred forty-nine participants completed the survey. Nearly all of the material required for the study is included in the study. **Table 1** represents the distribution of the participant's socio-demographic and amputation-related information. The mean age ± SD of the participants was 33.09 ± 11.13. The vast majority of participants (34.9%) were between the ages of 21 and 30. Out of 149 respondents, the majority of respondents (81.2%) were males, and 18.8% were females. The maximum respondents (65.1%) were unmarried, 67.8% were from rural areas, and 32.1% of the respondent's educational level was primary. Most of the respondents (66.4%) who caused amputation were road traffic accidents, where maximum amputation (45.6%) was done below knee amputation. The majority of the respondent's injury duration was more than 5 years and 55.7% of the respondents had a high level of satisfaction.

Table 01: Socio-Demographic and Amputation-Related Information of The Respondents (N=149)

Demographic	**%(n)**	**Demographic**	**%(n)**	**Demographic**	**%(n)**
Age		***Level of Education***		***Level of Amputation***	

<20 years	10.7% (16)	Illiterate	12.1% (18)	Through hip	4.7% (7)
21-30 years	34.9% (52)	Primary	32.1% (48)	Above knee	26.2% (39)
31-40 years	21.5% (32)	SSC	26.2% (39)	Through knee	17.4% (26)
41-50 years	26.2% (39)	HSC	22.1% (33)	Below knee	45.6% (68)
>51 years	6.7% (10)	Bachelor	7.4% (11)	Through knee	6.7% (10)
Gender		***Marital Status***		***Living Area***	
Male	81.2% (121)	Married	34.9% (52)	Rural	67.8% (101)
Female	18.8% (28)	Unmarried	65.1% (97)	Urban	32.2% (48)
Causes of Amputation		***Side of Amputation***		***Phantom Pain***	
RTA	66.4% (99)	Right sided	53.1% (79)	Feel pain	18.1% (27)
Industrial injury	33.6% (50)	Left sided	46.9% (70)	No pain	81.9% (122)
Years of Injury		***Year of Taken Rehabilitation***		***Level of Satisfaction***	
<5 years	47.7% (71)	<5 years	52.3% (78)	High	55.7% (83)
5-10 years	41.6% (62)	5-10 years	38.3% (57)	Moderate	34.2% (51)
>10 years	10.7% (16)	>10 years	9.4% (14)	Low	10.1% (15)

The Locomotors capability index (LCI) shows how independent the individual was when performing basic and advanced daily activities. Level 5 means total independence or can walk without any aids, level 4 means slightly independent or can walk with aids, level 3 means if someone is near the person, level 2 means if someone helps the person, and level 1 means no or total dependence. The majority 56.4% of the participants had physical functioning at level 4 which indicates the individuals are slightly independent or can walk with aids (**Table 2**).

Table 02: Functional Mobility Level of The Respondents (N=149)

Traits	Variable	Frequency (n)	Percentage (%)
Locomotors Capability Index (LCI)	LCI Level I	5	3.4%
	LCI Level II	11	7.4%
	LCI Level III	19	12.8%
	LCI Level IV	84	56.4%
	LCI Level V	29	19.5%

Table 3 represents the association between the socio-demographic variable and the physical functioning of the participants. The Spearman‘s test was done to analyze the correlation where the p-value was < 0.05 seems as significant. The results showed that there was a significant correlation between gender (p = 0.014) and current occupation (p = 0.001) with the total score of LCI respectively. In addition to that, there was no significant positive correlation among address, Educational status, side of amputation, or satisfaction level with LCI. Further, a significant positive correlation was found use of prosthesis (p = 0.014) with the total score LCI of the respondents.

Table 3: Correlation Between Socio-Demographic and Physical Functioning

Traits	Variables	Spearman Correlation Value	p-Value
Measuring the physical function with the Locomotor Capacity Index (LCI)	Age	-0.196	0.104
	Gender	-0.294	0.014*
	Marital status	0.108	0.372
	Educational status	0.128	0.290
	Current occupation	-0.375	0.001*
	Cause of injury	-0.145	0.233
	Side of amputation	-0.002	0.986
	Level of amputation	-0.150	0.216
	Phantom pain	-0.037	0.761
	Use of Prosthesis	0.309	0.009*
	Level of satisfaction	0.177	0.142

Discussion

The objectives of the study were to find out the demographic profile, functional outcome, and psychological outcome likely anxiety, and depression level of the unilateral LLA patients. 33.09 ± 11.13 was the mean age and standard deviation. Additionally, 34.9% of participants had partners, and the majority of them experienced injuries following their marriage, according to the study. 32.1% of respondents had only an elementary education, while the majority of respondents (67.8%) came from rural areas. In a related study, it was discovered that more men than women suffer from LLA **[4]**. Moreover, this study discovered that 18.1% of people had phantom pain. According to Esfandiari et al. **[12]**, 63.0% of people experience phantom pain. It also demonstrated that after a prolonged period of amputation, phantom pain occurs. However, additional research revealed results that differed from the study **[14]**. Most people who suffer a limb loss due to trauma or surgery go through a variety of complex physical and psychological reactions. Individuals who have suffered the agonizing loss of a limb have to adapt to a new reality, a new body, and a new self **[15]**.

According to the LCI, 43.07% of people can carry out their everyday fundamental tasks on their own without the use of an assistive device, according to the report. On the other hand, 49.40% of people can carry out their everyday tasks with the aid of assistive technology or other assisting devices. In terms of advance score, the proportion rise up to 65.50%. However, the study found that the subjects' physical functioning was higher. According to a study by Knezevic et al. **[4]**, patients who had transtibial amputations performed better on measures of physical functioning and overall health. There is no correlation between the type of amputation and physical functioning in the current investigation. Gender, present occupation, and degree of satisfaction with prosthesis use with LCI were significantly correlated.

Due to their physical state, the majority of participants change their occupation after amputation. Rather than other co-morbidities, occupational status was linked to a higher quality of life **[16]**. Road traffic accidents accounted for the majority of respondents (66.4%) amputation causes, with below-knee amputation accounting for the highest percentage (45.6%). Most respondents (47.7%) reported having been injured for more than five years, and 55.7% expressed high levels of satisfaction. Compared to people with disease-related amputations, young adults who have experienced traumatic amputation may be more likely to experience significant problems. To provide holistic treatment and improve their quality of life, amputees must have their numerous issues addressed. Raising awareness of the amputee's additional requirements among the community, medical professionals, and the patient's family is crucial **[17]**.

Limitation

There may have been some restrictions on the current investigation. There were certain restrictions on this study that made it difficult to evaluate the findings. The study's short study period and small sample size are its limitations. Regarding national viewpoints, there is also a dearth of literature and resources. A sufficient number of samples and an extended study period should be set up to support future research.

Conclusion

Amputation is a tragic and potentially fatal event that results in difficult life phases that impair functionality, interfere with everyday tasks, and create socio-economic and psychological challenges. It is evident that this debilitating illness affects the patient's physical health. The results of the study revealed that patients with LLA reported considerable independence with physical functioning. From the time of injury, specialist treatment is necessary to maximize health and promote functional adaption.

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Authors Contributions: The authors pledge to take responsibility for every assignment.

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