

# CAUSES OF LOWER LIMB AMPUTATION IN PATIENTS REGISTERED AT PAKISTAN INSTITUTE OF PROSTHETIC AND ORTHOTIC SCIENCES PESHAWAR-PAKISTAN

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## ABSTRACT

**OBJECTIVE:** To find out the main causes of lower limb amputation (LLA) during the four years period at Pakistan Institute of Prosthetic and Orthotic Sciences (PIPOS) Rehabilitation Services Programme (PRSP) Peshawar, Khyber Pakhtunkhwa, Pakistan.

**METHODS:** This retrospective cross-sectional study evaluated four-year records of the registered LLA patients from PRSP Peshawar for assessment and evaluation from January 2010 to December 2013. The collected data was analyzed using Microsoft Excel, descriptive analysis like means, standard deviation, percentages, range etc, on the bases of age, gender and causes of amputation were calculated.

**RESULTS:** Out of 5820 patient with LLA registered during the study period, 5116 (87.9%) were males and 704 (12.1%) were females. Mean age of patients was  $37 \pm 19$  years and about 67.6% (n=3933) patients were  $\leq 40$  years of age. Overall, trans-tibial amputations were common (n=3582/5820; 61.6%), followed by trans-femoral amputation (n=1496; 25.7%). Generally, an increasing trend in frequency of patients with LLA was observed over four years. Major causes of LLA were trauma (61.9%), reconstructive surgeries (15.4%), various diseases (8.2%) and congenital (2.1%). In 12.4% cases, cause of LLA was not documented. Bomb blast injuries (21.6%) and road traffic accidents (14.6%) were main traumatic causes of LLA and diabetes mellitus (4.6%) was the commonest disease-related cause of LLA.

**CONCLUSION:** Majority of patients were males and were  $\leq 40$  years of age. Trans-tibial amputations were common. Trauma (mainly bomb blasts injuries and road traffic accidents), reconstructive surgeries and various diseases like diabetes are the leading causes of LLA in patients at PRSP, Peshawar, Pakistan.

**KEY WORDS:** Amputation (MeSH); Amputation, Traumatic (MeSH); Lower limb amputation (Non-MeSH); Hip disarticulation (Non-MeSH); Trans femoral amputation (Non-MeSH); Knee disarticulation (Non-MeSH); Trans tibial amputation (Non-MeSH); Partial foot amputation (Non-MeSH); Accidents, Traffic (MeSH); Amputation, Congenital (MeSH).

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defined as amputation above the knee, below the knee or the foot amputation. Causes of lower limb amputations varies from country to country and also varies among developing and developed countries.<sup>3</sup> It is very difficult to determine the exact global burden of limb amputation due to poor record keeping in many countries.<sup>4</sup> In USA, 1.6 million people were living with an amputated limb in 2005 and this figure is expected to rise to 3.6 million in 2050.<sup>5</sup>

Pakistan is a country facing lot of health related issues due to war on terror and natural calamities like earthquake and floods over the last two decades. However, due to non-availability of robust epidemiological data, disease burden of lower limb amputation (LLA) cannot be established. Only a few studies on LLA have been conducted in civil and military hospitals of Pakistan.<sup>6,7</sup> Khyber Pakhtunkhwa (KP) province and Federally Administered Tribal Areas (FATA) are the main affected areas of war against terror and other natural calamities like floods and earthquake. However, there is no study available on demographics of LLA. Therefore, this study was planned to study the main causes of LLA at Pakistan Institute of Prosthetic and Orthotic Sciences (PIPOS) Rehabilitation Services Programme (PRSP) Peshawar, Khyber Pakhtunkhwa, Pakistan. PRSP was established in 2007 and provides rehabilitation services throughout Pakistan and particularly to Khyber Pakhtunkhwa and tribal areas.

## INTRODUCTION

Amputations are performed for variety of reasons including trauma, diseases, tumors, infections and congenital malformations, with the aim

to save the life of an individual.<sup>1</sup> Limb loss is one of the most physically and psychologically devastating event, not only causes major disfigurement but it also affect mobility, independence and quality of life.<sup>2</sup> "Major" lower limb loss is

## METHODS

This retrospective study was conducted at PIPOS Rehabilitation Services Programme, Peshawar, Khyber Pakhtunkhwa, Pakistan. Data was collected from the available record of

**TABLE I: AGE DISTRIBUTION AMONG REGISTERED PATIENTS (JANUARY 2010 – DECEMBER 2013)**

Year	Age Groups (years)					Total
	01 – 10 [n (%)]	11 – 20 [n (%)]	21 – 30 [n (%)]	31 – 40 [n (%)]	> 40 [n (%)]	
2010	42 (3.64)	179 (15.51)	294 (25.48)	209 (18.11)	430 (37.26)	1154
2011	60 (4.48)	180 (13.43)	355 (26.49)	315 (23.51)	430 (32.09)	1340
2012	71 (4.32)	286 (17.41)	425 (25.87)	323 (19.66)	538 (32.74)	1643
2013	82 (4.87)	313 (18.60)	435 (25.85)	364 (21.63)	489 (29.06)	1683
<b>Total</b>	<b>255 (4.38)</b>	<b>958 (16.46)</b>	<b>1509 (25.93)</b>	<b>1211 (20.81)</b>	<b>1887 (32.42)</b>	<b>5820</b>

**TABLE II: TYPE OF LOWER LIMB AMPUTATION IN BOTH GENDERS AMONG REGISTERED PATIENTS**

Type	Male [n (%)]	Female [n (%)]	Total [n (%)]
Hip Disarticulation	21 (91.3)	2 (8.7)	23 (0.2)
Trans Femoral Amputation	1329 (88.8)	167 (11.2)	1496 (25.7)
Knee Disarticulation	332 (87.6)	47 (12.4)	379 (6.5)
Trans Tibial Amputation	3128 (87.3)	454 (12.7)	3582 (61.6)
Partial Foot Amputation	306 (90.0)	34 (10.0)	340 (5.9)
<b>Total</b>	<b>5116 (87.9)</b>	<b>704 (12.1)</b>	<b>5820</b>

**TABLE III: CAUSES OF LOWER LIMB AMPUTATION AMONG REGISTERED PATIENTS**

Causes of Amputations		Frequency (n= 5820)	Percentage
<b>Traumatic</b> (n=3603/5820; 61.9%)	Bomb Blasts	1259	21.6
	Road Traffic Accident	847	14.6
	Firearm Injuries	671	11.5
	Other War injuries	497	8.5
	Land Mines	139	2.4
	Work-related Trauma	122	2.1
	Shelling	40	0.7
	Burns	28	0.5
<b>Reconstructive Surgeries</b> (n=896/5820; 15.4%)	Tibial Spur	535	9.2
	Neuroma	186	3.2
	Severe Contractures	175	3.0
<b>Cause Not Documented</b> (n=721/5820; 12.4%)		721	12.4
<b>Diseases</b> (n= 478/5820; 8.2%)	Diabetes Mellitus	267	4.6
	Deep Vein Thrombosis	71	1.2
	Osteosarcoma	48	0.8
	Carcinoma	39	0.7
	Gangrene	39	0.7
	Osteomyelitis	14	0.2
<b>Congenital</b> (n=122/5820 ; 2.1%)		122	2.1

patients registered at PRSP Peshawar from January 2010 to December 2013. The following information were collected on the data extraction form:

- Information about gender and age
- Information about level of amputation
- Information about cause of

amputation

The collected data was analyzed with the Microsoft excel (2013) and descriptive statistical analysis was done, means, standard deviation (SD), percentages, range etc, on the bases of age, gender and cause of amputation were calculated. Sample included

patients registered during the prescribed period at PRSP Peshawar mainly belonging to KP and FATA, both genders were included irrespective of the level of amputation, cost, creed, religion and age limit. Patients registered before January 2010 and after December 2013, those with upper limb amputations and with other disabilities were not included in the study.

## RESULTS

Five thousand eight hundred and twenty patients with lower limb amputations were registered during the four years study period (January 2010 – December 2013). The mean age was 37±19 years with a range of 7 to 67 years. About 67.6% (n=3933) patients were ≤40 years of age and 32.4% (n=1887) were in age group >40 years (Table I). Overall, 31.4% increase in patient's registration was found from 2010 to 2013, the number of registered patients rose from 1154 in 2010 to 1683 in 2013.

About 87.9% of the registered patients were male and it remained very high at all levels of amputations in the lower limb. Overall, trans-tibial amputations were common (n=3582/5820; 61.6%), followed by trans-femoral amputation (n=1496; 25.7%). Type of LLA and gender distribution is given in Table II.

Major causes of LLA were trauma (61.9%), reconstructive surgeries (15.4%), various diseases (8.2%) and congenital (2.1%). In 12.4% cases, cause of LLA was not documented (Table III).

Bomb blast injuries (21.6%), road traffic accidents (14.6%) and firearm injuries (n=671; 11.5%) were the main traumatic causes of LLA. Neuroma contributing to 186 (3.2%) cases was the major cause of LLA during reconstructive surgery. Diabetes mellitus (4.6%) and deep vein thrombosis (n=71; 1.2%) were the most common disease-related cause of LLA.

## DISCUSSION

Over the four years period (January 2010 to December 2013), an increase of 31.4% in patients registration was found for their rehabilitation with the

provision of artificial limbs. More astonishingly the younger population (below the age of 40 years) was about 68% of the total number of registered patients. This is an eye opening for all health care providers and policy makers to provide better facilities and a long term planning for the rehabilitation, social reintegration and empowerment in the society.

Amputation caused due to trauma contributed to about 62% of the registered patients. Majority of LLA in the developing world are due to trauma-related causes.<sup>8,9</sup> Pooja and Sangeeta reported trauma as a major cause (70.3%) of amputation in India in all age groups.<sup>10</sup> In Nepal, the amputations caused by trauma were as high as 86.58%.<sup>8</sup> Similarly in Iran, traumatic amputations remained with highest figure (46%).<sup>11</sup> In Pakistan, Masood J, et al.<sup>6</sup> reported trauma (45.3%) as a second leading cause of LLA in Civil Hospital of Karachi. While Rathore FA, et al.<sup>7</sup> reported trauma in almost all (96.7%) patients in military rehabilitation center. Findings of Rathore FA, et al.<sup>7</sup> are plausible in military context where mine blast injury (59.3%) and other causes like multiple shrapnels and rocket/missile related injuries were reported. In our study, higher proportion of bomb blasts injuries (21.6%), firearm injuries (11.5%), land mines (2.4%) and other war injuries (8.5%) reflected the impact of war on terror, the personal/inter-tribal enmities and across the border firing along the border with Afghanistan and India.

Road traffic accidents (RTA) in our study was the second most common (14.6%) traumatic cause of LLA. Masood J, et al.<sup>6</sup> have not reported any case of RTA in their study while Rathore FA, et al.<sup>7</sup> had cases of RTA but not mentioned the exact figures. Singh G, et al.<sup>12</sup> reported 21.79% cases of RTA in LLA in India. RTA was also the major contributor of traumatic amputation in Indian patients, as reported by Maqsood M, et al.<sup>13</sup> In Nepal, RTA accounted for 74.29% cases of traumatic sub-groups of LLA. This shows the gravity of road safety issues in the South Asian region.

Reconstructive surgeries were performed in 15.4% cases, in our study,

mainly for tibial spur, neuroma and severe contractures. These issues were not addressed in previous local studies. Issues of reconstructive surgeries, prosthesis and rehabilitation in amputations of limbs during the 2005 earthquake in Pakistan were highlighted by Awais SM, et al.<sup>14</sup>

Diabetes mellitus was on top among medical diseases requiring LLA, in our study, accounting for 4.6% cases. Masood J, et al.<sup>6</sup> reported diabetes as the leading (54.7%) cause of LLA in Pakistan. Humail SM, et al.<sup>15</sup> reported diabetic foot as a major cause (70.76%) of LLA in hospital-based study at Karachi. In Pakistani diabetic patients, foot ulcer is the major cause of LLA, which is preventable by good glycemic control and foot care.<sup>16</sup> In 12.4% cases, cause of amputation was not documented and needs attention of the PIPOS administration for future record keeping.

Most common sites of LLA in our study were trans-tibial amputation (below knee amputation) in 61.6% cases and trans-femoral amputation (above knee amputation) in 25.7% cases. Rathore FA, et al.<sup>7</sup> had similar findings, reported trans-tibial amputation in 65% cases and trans-femoral amputation in 30% cases. To save the natural knee joint is one of the key addition to the effective rehabilitation in terms of achieving smooth and efficient gait, natural knee function and less energy consumption after rehabilitation.

Another important finding of our study was that about 67.6% of our patients were  $\leq 40$  years of age and mean age of patients was  $37 \pm 19$  years. Rathore FA, et al.<sup>7</sup> reported 86.2% patients between 20-40 years of age. Similar results were also reported from India<sup>10,12</sup> and Iran.<sup>11</sup> Gender distribution showed male predominance (87.9%) in our study. Masood J, et al.<sup>6</sup> reported 86.8% male patients and Rathore FA, et al.<sup>7</sup> had 100% male patients. Other developing countries also reported male preponderance for LLA.<sup>9-12,17</sup> Due to tribal background and Pathan culture, young males are more involved in personal enmity and are more prone to injuries and road traffic accidents compared to the female population, who are less likely to get out of homes.

Other contributing factors are direct and indirect effects of the 4 decades long Afghan war, war on terror and bomb blasts on the tribal belt and the province of Khyber Pakhtunkhwa.

## CONCLUSION

Majority of patients were males and were  $\leq 40$  years of age. Trans-tibial and trans-femoral amputations were common sites of amputations. Traumatic causes were predominant including bomb blasts injuries and road traffic accidents. Reconstructive surgeries and various diseases like diabetes are the other leading causes of LLA in patients at PRSP, Peshawar, Pakistan.

## RECOMMENDATIONS

It was good to see that the surgeons prefer to save the natural knee joint by carrying out trans tibial amputations more often. However, further research at a greater scale (including data from all tertiary hospitals) is need to determine the exact nature of the amputations in the lower limb of both genders and the different years of age. Documentation and record keeping of the institutions needs improvement to fill the gap in data management.

Looking at the varying results in patients registered for rehabilitation at PIPOS/PRSP, it is recommended to have a long term planning for the rehabilitation of these patients, which include a greater number of younger populations. In addition, social rehabilitation, reintegration into society and empowerment are the issues to be addressed to ensure compliance on the rights of the persons with disabilities.

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## AUTHORS' CONTRIBUTIONS

Following authors have made substantial contributions to the manuscript as under:

**AA:** Concept & study design, acquisition of data, drafting the manuscript, final approval of the version to be published.

**OA:** Acquisition & analysis of data, drafting the manuscript, final approval of the version to be published.

**NA, TR, MG:** Acquisition of data, critical review, final approval of the version to be published.

*Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.*

### CONFLICT OF INTEREST

Authors declared no conflict of interest

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