

Epidemiological Trends of Lower Limb Amputation in Artificial Limb Centre

Dr. (Lt Col) Sonu Singh

MBBS, MD Physical Medicine & Rehabilitation

Assistant Professor, Mahatma Gandhi Medical College & Hospital, Jaipur

Address for correspondence: 16-B, Govind Marg, Opposite Gurudwara Raja Park, Jaipur-302004

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Abstract— *Main aim of our study was to compose an inclusive report on the “Epidemiological Trends of the lower limb amputation in two different population groups”. This is a retrospective study carried out at Artificial Limb Centre (ALC), Pune from 1st February 2012 to 31st January 2016. A total of 3402 patients who had undergone the prosthetic rehabilitation at the ALC, Pune were included in our study. All the patients after initial assessment were divided into two groups, 1. Defence Personnel’s & Dependents 2. Civilian patients.*

The patients were evaluated with respect to age, sex, aetiology, site, level and prevalence of amputation among the sexes at different ages and surgical interventions performed and It was found that the physical trauma was still one off the leading cause of major Lower Limb Amputation in developing countries, but new emerging causes like “Metabolic and Vascular” were showing the continuously increasing trends. The reason for this change was rise in the diabetes & its associated complications. This study is therefore intended to provide an insight into epidemiological trends of major lower limb amputation in army personal, dependents and general population.

Keywords— *Lower Limb Amputation, Trauma, Prosthesis, Defense Personnel, Artificial Limb Centre.*

I. INTRODUCTION

The major limb amputation has been performed for injured/traumatic/neurologically and vascular compromised body parts for over 2,500 years from now. Previously Physical Trauma, Peripheral Vascular Diseases and Cancer were the prominent disorders, but now a day’s causative pattern has been shifted to Metabolic/Vascular disorders. Amputation which is being done for a wide range of nonhealing/infective/rapidly spreading disorders is affiliated with marked disability, morbidity and mortality.

The word “Amputation” originally came from a Latin word “amputare “which means “to excise/cut out” is generally described as the “removal of a part of the extremity or complete body part/parts covered with the skin”.¹Amputation is associated with profound psychological, social and adverse outcome for the patient & his/her family members. It is also associated with marked disability, morbidity and early mortality particularly in countries where the acceptance and knowledge about the prosthesis is generally poor [2], [3]. In most of the underdeveloped countries prosthesis is generally not easily available, costly and not conducive to patient at home and his/her work environment. Above all poor prosthetic management leads to so many secondary complications like (Stump Edema, Pain, Infection and secondary vascular/neurological complications).

In developing countries particularly in younger population group Physical trauma, Infections and Malignancies [4] are few of the leading cause of amputation whereas in elderly population Uncontrolled Diabetes Mellitus induced Vascular/Neurological complications, Infections and malignancies are the principle reasons for major lower limb amputation. Whereas in developed countries Peripheral Vascular Disease (PVD), either alone or as a secondary complication of Diabetes

Mellitus and other metabolic/vascular disorders, contributes almost half of all amputations [4], [5]; physical trauma generally comes next.

Regardless of the cause of Major limb amputation, loss of part/complete limb bears a compelling and drastic affects on the patient and his/her family, as one progress from the stages of impact, to acceptance, and lastly adjustment with himself and his environment [6]. Horne et al. [7] during his study in 2009 pointed out that loss of any body part can lead to a threefold insult to the patient's growth, like loss of activity level, loss of perception, and damage or change to his/her own body image.

Numerous studies have reported a gradual increase in the occurrence of lower limb amputations in developing nations primarily the result of metabolic/vascular disorders, whereas in developed nations incidence is falling over the years for differing manifestations including foot gangrene resulting as a bad result of uncontrolled diabetes mellitus, physical trauma and traditional bone setters' gangrene.

It is very important that center-specific prevalence, indications and design be determined as an introduction to setting up strategies to locally and globally scale down this risk. For this reason, our study is intended to provide essential information regarding recent epidemiological trends of lower limb amputation in army personal, dependents & general population.

II. METHODS

2.1 Subjects

A retrospective analytical study was carried out at this center on lower limb amputees, who had undergone prosthetic rehabilitation at this center. A total of 3408 patients who had visited this center during the period of 1st February 2012 to 31st January 2016 were included in our study. All the patients after initial assessment were separated into different groups as per patient's profile. Main Groups were 1. Serving Personnel's, 2. Ex-Serviceman (ECHS), 3. Dependents, 4. Civilian patients.

2.2 Data collection

Data collected digitally as well as manually at this center were utilized for this study. Since this was a retrospective analytical study involving the old medical records only, no informed consent was required either from the patient's/Their family members. Data included were primarily demographic components and general patient traits including age, sex, extremity involved and primary reason for amputation.

2.3 Data analysis

The patients were evaluated with respect to age, sex, etiology, side & level of amputation, prevalence of amputation among the sexes at the different ages and surgical interventions performed. The results were analyzed by SPSS software.

III. RESULTS

During these four years 4614 patients with amputation at different levels visited this center. Out of these 4614 patients, 3408 (73.86%) were Lower limb amputees and rest 1206 (26.14%) were at other levels. Out of these 3408 cases 1724 (50.51%) were from defense category and rest 1684 (49.41%) were civilians.

TABLE 1
NUMBER OF CASES AT DIFFERENT LEVELS VISITED THIS CENTER

	No. of Cases
Serving/ECHS/Dependents	1724 (50.51%)
Civilians	1684 (49.41)

TABLE 2
NUMBER OF CASES WITH DIFFERENT AGE GROUP VISITED THIS CENTER

Age Group	Serving/ECHS/Dependents	Civilians
1-10 Years	21 (1.21%)	208 (12.35%)
11-20 Years	168 (9.74%)	181 (10.75%)
21-30 Years	718 (41.65%)	624 (37.05%)
31-40 Years	472 (27.38%)	413 (24.52%)
41-50 Years	136 (7.89%)	186 (11.04%)
51-60 Years	171 (9.92%)	45 (2.67%)
61-70 Years	21 (1.21%)	19 (1.13%)
71 Years and Above	17 (.98%)	08 (.47%)

TABLE 3
NUMBER OF CASES WITH DIFFERENT CAUSE OF INJURY VISITED THIS CENTER

Cause of Injury	Total No. of Cases	
	Serving/ECHS/Dependents	Civilians
RTA + Crush Injuries + FFH	477 + 9 + 20 (29.35%)	551 + 13 + 23 (34.86)
MBI + Frostbite	415 + 46 (26.74%)	13 + 2 (.89%)
Train Accident	206 (11.95%)	167 (9.91%)
Gangrene	134 (7.77%)	193 (11.46%)
Congenital (Since Birth)	17 (.98%)	344 (20.43%)
Electric Shock	23 (1.33%)	36 (2.14%)
Machine Accident	21 (1.21%)	83 (4.92%)
Others	359 (20.82%)	256 (15.20%)

RTA: Road Traffic Accident

FFH: Fall from Height

MBI: Mine Blast Injury

In defense and dependent population 3 leading causes of lower limb amputations in decreasing order was:

1. RTA + Crush Injuries + FFH
2. MBI + Frostbite
3. Others

Whereas in civilian population 3 leading causes of amputation are:

1. RTA + Crush Injuries + FFH
2. Congenital (Since Birth)
3. Others

Road Traffic Accidents was the leading cause of LLA in both the population groups. Mine Blast Injury and Frostbite is 2nd common causes of Lower Limb Amputation in Defense Personnel's whereas congenital deformities are the 2nd leading source of lower limb amputation in civilian population. Train Accidents and Vascular Gangrene was a common cause of Lower Limb Amputation in both the population groups. Vascular causes (Diabetes Mellitus and its complications, Hypertension) and Malignancies were the 3rd most common cause of lower limb amputation in both the population groups and they are now showing explosive growth.

In both the population groups' comparatively active age group (21-40 years) was accounting for more than 2/3rd of the cases of lower limb amputation.

IV. DISCUSSION

As per Metz, the worldwide prevalence of disability due to Amputation was 7% in industrialized countries [8] and 4% in developing countries [8]. As per statistical report of 2001, the prevalence of disability in India is 1.8–2.2%⁹.

Who report on disability showed that there are huge regional variations in the etiology of major lower limb amputation in different population groups. Sansam et al described in 2009 that physical trauma is the leading cause for majority of amputations in India, whereas poor vascularity was the dominant cause in most industrialized nations [10]. Sujatha [11] in her analysis at the Government Institute of Rehabilitation Medicine, K.K. Nagar, Chennai, reported that most of the patients be deprived of their limbs because of road traffic accidents. Amputation due to vascular complications secondary to diabetes is ranked second.

This grouping is very similar to Obalum and Okeke study, which investigated only lower limb cases and disclosed that the peak age for amputation was 21–30year age group [12].

The chief reason for the amputation in a particular region is influenced by the degree of industrialization, the local transport structure, and the standard of local health care system. In Indian subcontinent, physical trauma is still the dominant reason for lower limb amputation because of its quick transformation into a greater industrial and mechanized nation since 1947, and the rapidly increasing volume of traffic, along with increased speed. This is almost identical to the clinical findings of Lento [13], who came to an end that traumatic amputations were far more frequent than vascular amputations in developing nations in comparison to developed nations, likely because of the lesser number of cases with obesity and other metabolic disorders in such regions, in addition to the high exposure to agricultural machinery, which many a times can lead to lower limb amputations. Traumatic limb amputations can also be the result of the use of electric power saws and other heavy machineries, as well as electric burns or electrocution. Motor vehicle accidents (Car, Motorcycles, Other vehicles), Fall from Height and Gunshot wounds from any cause may also contribute to the traumatic limb amputations.

Looking at the causes of amputation as per age group, Lento [13] and Ephraim and Duncan [14] reported that peripheral vascular disease (PVD) mainly involved the elderly age group, especially age group of 60 years and above. These reports are consistent with our study, which also exhibit that amputations because of Road Traffic Accidents occurred much more often in the young age groups, while cases secondary to peripheral vascular diseases were more common in the age groups 60 years and older.

Cases of lower limb amputation secondary to malignancy are far more common in the teen age in comparison to the other age groups. This primarily seemed to be because of osteogenic sarcoma, a malignancy that primarily appears mainly in young age [15].

Lower limb amputation generally accounts for 94.8% of all amputations. This is very similar to the figures reported by Obalum and Okeke [12] and Lento [13], which also stated that the lower limb amputations are performed much more common than upper limb amputations. Among lower limb's amputations, transtibial is the most common site. Because of the common tendency of the distal portion of a limb is generally more likely to be injured in any traumatic event, and surgeons generally tries to amputate as distally as possible to preserve functional activity, whereas, in amputation cases secondary to malignancy, transfemoral amputation was the most common site of amputation.

The complications and the mortality rate from accidents involving land mines are high in armed force personnel. Half of the mine victims die within minutes of the blast and 85% of child victims die before they reach the hospital. The principle reason of death in these cases is mainly infection and crush injuries in the patients who survive the initial shock blast wave. In an international series from Russia, frequency of complications was reported as high as 70% with total lethality going up to 5.2% [16, 17]. In Iran, most fatalities (36%) occurred in the pre-hospital settings during a study for a period from 1989-1999 [18].

V. CONCLUSION

Traumatic amputations was the leading causes of amputation in both army and civil population particularly in younger population in the past but now Metabolic and Neoplastic causes are replacing the existing traumatic cause. Metaobolic and Neoplastic causes are also appearing in young population group, so there is a strong need to control these problems at an early age to prevent future complication and irreversible loss of organs.

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