Original Article

Lower Limb Amputations in Central Gujarat: A Retrospective Analysis of Multiple Camps

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Abstract

Background: The 1986 report of Dinesh Mohan stated India with approximately 500,000 amputees with almost 23,500 expected to be added annually. Since the year 2013, ALIMCO-Government of India Undertaking along with "Rehabs" clinic conducted the assessment, fabrication, and fitting of prostheses to the amputees of Gujarat. The main objective was to analyze the prevalence and details of lower limb amputees in central Gujarat during the last 7 years. **Study Design:** This was a retrospective analysis. **Methods:** Several camps were conducted in central Gujarat between the years 2013 and 2019. This study analyzes records of lower limb amputations (LLAs) for number, age, gender, site, causes, etc., **Results:** One hundred and fifteen camps were conducted. Amongst LLAs between the years 2013-2019, number of trans tibial amputations ranged between 57% -69% and trans-femoral 21 - 32 % only 10% having bilateral amputations &others. Males outnumbered females. Major cause trauma ranged 77.93% - 87.23%, congenital causes ranged between 1.37 and 2.26%. Age of amputees was between 7 years and 86 years with majority in the range of 21–60 years. **Conclusion:** This study reports on prevalence of LLAs in central Gujarat, males outnumber females, with major cause being trauma, number of amputees <21 and >60 years of age were small.

Keywords: Epidemiology, lower limb amputations, physiotherapy, prevalence, rehabilitation

Introduction

In the 1st century "amputation of gangrenous extremity" was described by a Roman scientist. Thus, amputation is one of the oldest and most serious operations in history[1-3] Latin word "amputare" means to excise, meaning the removal of part or all of a body part.[4]

A number of surgical techniques have been described starting from Hippocrates, and prosthetic technology made major development between the American Civil War 1861–1865[1,5] till date. Thus, with surgical skills, development of prostheses also improved, with wars acting as stimulation.[5,6] The US influenced the number of countries of the world on the improvement of prosthetics.[6,7].

In the USA,[8] 1995, 5-level functional classification was adopted (K0, K1, K2, K3, and K4) to describe the functional abilities of a person with lower limb amputation (LLA).[8] It has been suggested that several factors such as age, time since amputation, number, and severity of comorbidities have a significant impact on amputee's course of rehabilitation and mobility.[8,9] According to Esquenazi,[10] it is hard to establish the exact number of amputations worldwide due to deficiencies in health records.

The pilot project of identifying amputees and fitting appliances was initiated in the month of March 2013 by ALIMCO-Government of India Undertaking along with Rehabs. This was done by conducting various camps held at various districts of central Gujarat. The successful completion prompted similar projects in the forthcoming years in several other districts, "Rehabs" personnel identified and conducted the assessment, fabrication, and fitting of appliances.

There are several epidemiological studies reported from various countries. The incidence of lower limb amputations outweighs the upper limbs. The report by Dinesh[11] states that India had approximately 500,000 amputees with almost 23,500 expected to be added each year. State to state prevalence varies.

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The present study reviews the LLAs in central Gujarat during the last 7 years.

Methods

A retrospective analysis was done of various camps conducted in central Gujarat between period, year 2013 to 2019.This study analyzes records of all lower limb amputations (LLA) for number of amputees, age, gender, site, causes etc. between the period.

Procedure

A retrospective analysis of various camps conducted in central Gujarat between period, year 2013–2019. This study analyzes records of all LLA for number, age, gender, site, causes, etc., between the period.

Results

There were in all 115 camps between the year 2013 and 2019 Age range of the amputees varied from 7 years to 86 years with majority in the range of 21–60 years Number of TTA - 989 Number of TFA - 407 Males outnumbered females, Major cause - trauma, Congenital causes ranged between 1.37 and 2.26%.

Discussion

Amputation in any individual results in severe stress as it is an irreversible option. Refined surgical techniques and sophisticated prosthesis cannot replace the loss. Various surveys conducted from time to time in India have shown a large number of disabled persons, although, in 1986, Dinesh[11] reported that in India, the prevalence rate of 1.8% of acutely disabled is less than the US 2.8%[11] The census of India in 2011 reports persons with disability (PWD) (locomotor) population to be 2.22% of the total population, however actual estimate of amputees is not known and is likely to vary from state to state[5,11,12] According to Dinesh and Sahu *et al*. 2016,[11,13] 0.62 amputees/1000 population is the rough incidence and this equals to approximately 1 million people with amputations in India.

The present study [Table 1] shows details of camps and the number of LLAs. The number of prosthetic fittings done ranged between 141 and 349 in different years. As seen among the LLAs, transtibial amputations were highest in the range of 57%–69% next being the transfemoral 21%–32%, and about 10% having bilateral amputations and others. Similar findings are supported in various studies.

According to A. Esquenazi 2004[10], the ratio of lower limbs to upper limbs amputations is 5:1 based on the etiology related to medical morbidities affecting &leading to amputations. This study reported 39% trans tibial, 31% trans femoral while in upper limb trans radial 15% and trans humeral 8% were reported[10],the number of lower limb amputations exceed upper limbs as agreed by various studies.[2,4,7,9,10,12]

Pooja and Sangeeta, 2013,[2] reported LLAs to account for 94.8% and upper limb only 5.2%. Uchytil *et al*., 2017,[14] state that major amputations performed annually globally range between 200 and 500/million people and 85% are LLAs.

Unnikrishnan *et al*., 2017,[4] reported LLA to be most common and TTA to be 53.1%, while TFA was 37.1%. Raichle *et al*., 2008,[15] also reported TTA (56.1%), followed by TFA (30.1%) more common. Hawkins *et al*., 2016,[16] reported 78% having TTA. G Singh et al, 2009[17] reported TTA as (67.78%), TFA to be 18.84%, foot amputation (9.07%), Symes amputation (3.15%)and other amputation (1.16%), bilateral amputation accounted for 16.78%, the author also states that this was agreed by various studies including surveys conducted by United States, Department of Health and Human Services that below knee amputation was the commonest level of amputation.

In the present study (table 2) between the years 2013 - 2019, 4.29 % and 7.56 % amputees were < 21years of age; and 10.89% to 19.59% of amputees were >61 years of age.10.47 % to 26.92 % amputees fell within the age range of 21 to 60 years. According to 2004 Alberto E[10], amputations number by age are difficult to acquire. The author of this study reported 60% of the amputees to be in the age range of 21 and 64 years and 10% only are under 21 years of age.

Raichle *et al*., 2008,[15] reported the mean age to be 54.36 ± 14.62, range varied from 19 to 92 years. In 2008M. Asano *et al*.,[15] also reported the average age as 61.9±15,7 years and in the different age ranges viz in 23-55 years

Table 1: The details of camps between the years 2013 and 2019 and the cases of lower limb amputations seen both in camps and clinic

Serial number	Year of camp	Number of camps	TFA/AK (%)	TTA/BK amputations (%)	Bilateral/others (%)	Total
1	2013	16	61 (27.6)	137 (61.99)	23 (10.4)	221
2	2014	4	46(24.1)	125 (65.44)	20 (10.47)	191
3	2015	17	90 (30.9)	167 (57.38)	34 (11.68)	291
4	2016	20	65 (32.66)	117(58.79)	17 (8.54)	199
5	2017	32	81 (23.2)	239 (68.48)	29 (8.3)	349
6	2018	26	33 (21.15)	106 (67.94)	17 (10.89)	156
7	2019	0	31 (21.98)	98 (69.5)	12 (8.51)	141

TFA/AK: Transfemoral / Above Knee Amputations, TTA: Transtibial amputations

the % age of amputees were 33.49%; in age range 56-70 years were 31.32 % and in the age group >71 years were 35.18% of amputees, showing more amputation in elderly population.

Similarly, author in 2013[2] reported the age of amputees ranging from <20 years to >70 years. They also reported that common age was between 21 and 30 years accounting for 32% of all amputees and 23.2% amputees in the age range of 31–40 years. Only 14.2% accounted for <20 years.[2]

Maqsood, *et al*., 2015,[3] over the period of 11 months also reported the age range of their subjects as 17–70 years with a mean of 43.5 years. However, age-wise distribution was uniform in this series, contrary to the present study and Kolkata study.[2]

In 2016, Hawkins *et al*.[16] also reported the mean age as 58 years with age ranging from 21.9 to 92.7 years. In 2017,_Unnikrishnan *et al*.[4]similarly reported the age ranging between 23 and 90 years. In 2009 G Singh *et al*[17] reported that in the armed forces, 77.38% disability was in the age group of 18 to 30 years and 14.57% in the 31-40 age group, 7.65% in the age range 41-50 years, and only 0.40% above 50 years.[17]

Kashif *et al*., 2004,[19] reported age range varying from 22 to 52 years and their majority of cases fell in the 20–29 years of age. Doğan *et al*., 2008,[1] also report amputations common in the age range of 21–30 years and < 10 years accounted for only 10%[1] In 2011, Sinha *et al*.[20] study reported the mean age of the amputees as 43.7 ± 15.

Gender distribution in the present study as seen in [Figure 1] males exceeds females in all levels of LLA. A higher prevalence of amputations in males is reported in several studies.[2-5,13,16,18,20] Hawkins *et al*., 2016,[16] quote males female ratio as 4:1. Various reasons stated are that males due to their inherent role of supporting the family, working outsides, are prone to accidents also in comparison to females are more exposed to cigarette and tobacco products, therefore have increased risk of PVD and thus amputations.[10]

In the present study the major cause [Figure 2] was seen to be trauma the %age of trauma in different years from 2013-2019, range from 77.93% to 87.23%. Amputation due to diabetes ranged between 5.67% and 11.74%. Amputations due to PVD ranged between 3.78% and 7.44%. Congenital causes ranged between 1.37% and 2.26% across years. The others ranged between 0.52% and 1.41%.

In 2019, O'Keeffe and Rout[5] also report trauma to be the main cause in India. Pooja and Sangeeta[2] study in Kolkata reported 70.3% amputations due to trauma, a leading cause except in the age group > 60 years. The reasons mainly were road traffic accidents, railway accidents, burns, electrocution, and chemical injuries. The second most common cause of amputation as reported by author was PVD (27.7%), the rise in the number of amputations in this category paralleled age.

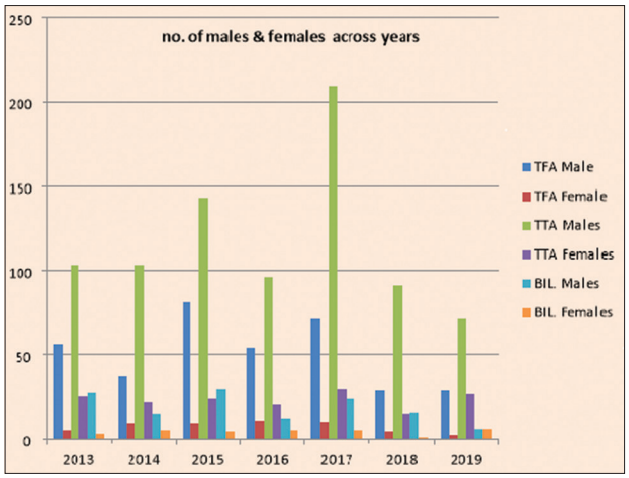

Figure 1: Gender wise distribution for TFA, TTA Bil, and others

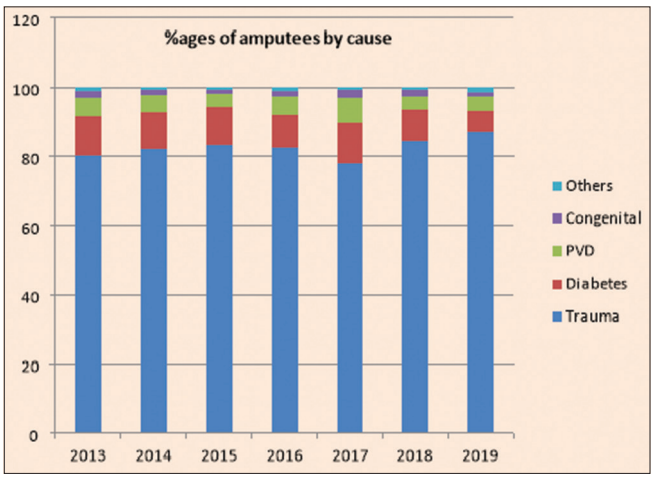

Figure 2: Number of amputees as per cause across the years

Table 2: Age-wise distribution of lower limb amputations

Year	<21 (%)	21–30 (%)	31–40 (%)	41–50 (%)	51–60 (%)	61 and (%) above
2013	4.98	21.72	19.46	19.46	21.27	11.76
2014	5.76	16.23	23.04	29.32	10.47	15.18
2015	7.56	14.08	21.65	21.65	22.68	12.37
2016	5.52	16.58	19.59	20.60	18.09	19.59
2017	4.29	12.03	23.21	23.49	24.64	12.32
2018	6.41	15.38	25.64	26.92	14.74	10.89
2019	6.38	21.27	20.57	21.28	14.18	16.31

Amputation following malignancy was reported in three cases; of these, two of them were in teens.

Singh *et al*., 2009,[17] reported 93.83% of cases with trauma as young soldiers are less prone to be disabled due to diseases. Mine blast injuries (41.74%), gunshot wounds, and railway accidents (6.78%) were reported. In 2016, Sahu *et al*.[13] also state trauma to be the primary cause leading to amputations with others representing a small percentage.

Doğan *et al*., 2008,[1] also report trauma to be foremost (40.2%). The author also reported region-specific causes, namely frostbites, tandoor burns, and mistreatments by bonesetters. In 2008, Asano *et al*.[18] stated cause of amputation as either vascular (53.0%) or nonvascular (47.0%), amputations due to cancer or congenital conditions are few.

In 2008, Raichle *et al*.[15] reported injury to be a common reason of amputations (53.5%), following this other causes such as infection (23.4%), vascular disease (22.3%), and gangrene (20.9%) with other causes as 13%.

According to several studies,[16,20-23] the high number of LLAs is due to vascular etiology (80%–84%), equally contributed from diabetes and PVD among the elderly in Japan, US, Europe, and Brazil, and trauma accounts for < 10%. As agreed by a number of authors, vascular cause increases with time and age.

In 2015, Maqsood *et al*.[3] report major etiologies as diabetes and PVD (36.11%) to be the leading cause of amputation following this trauma (30.56%). Moreover, the author concluded that diabetes may be a rapidly increasing cause in the future for LLA. Unnikrishnan *et al*., 2017,[4] also similarly reported that in a center in Kerala, India, predominant etiology emerged to be diabetes (39.5%), trauma leading to amputation was the cause in small percentage, in the young.[4]

According to several studies, congenital limb deficiencies account for 1%–4%[10,15,24] Varma *et al*.[9] state the rate of congenital deficiencies to be similar across different countries falling between 2 and 7/10,000 live births.

According to A. Esquenazi,[10] causes of amputations vary from country to country, in developing world trauma leads, as also in countries at wars and civil unrests trauma accounts for >80%. In developed nations like US, Japan disease accounts for 68% of all amputations performed each year. However, the burgeoning problem of diabetes and PVD is likely to raise the number of amputations even in the developing world.[3,11,13,25]

The authors[9,24,25] have reported that 1.6 million people in 2005 with amputations will by the year 2050 more than double to 3.6 million with loss of limb in the US, thus estimating the incidence rate to be 185,000. These projections as per the authors assume age, sex, and race to remain constant. In African–American populations also, amputation incidence is high (5.0–6.5/10.000 individuals) regardless of the geographical reason.[25]

According to Girijala and Bush[25]2018, uncertainties of health care coverages and shifting demographics, predicts rise in LLAs in future. There is need for effective programs, policies that guarantees easy access to technology to ensure functional well being of amputees.[24] Although, till date, there have been continuous efforts in India, it is estimated by Sabut and Mohanty *et al*., 2017,[12] that only 5% of amputees receive prostheses.

Conclusion

This study reports on prevalence of LLAs in central Gujarat, males outnumber females, with major cause being trauma. Congenital causes ranged between 1.37%– 2.26%, and number of amputees <21 years and >60 years of age were small.

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Conflicts of interest

There are no conflicts of interest.

References

1. Doğan A, Sungur I, Bilgiç S, Uslu M, Atik B, Tan O, *et al*. Amputations in eastern Turkey (Van): A multicenter epidemiological study. Acta Orthop Traumatol Turc 2008;42:53-8.
2. Pooja GD, Sangeeta L. Prevalence and aetiology of amputation in Kolkata, India: A retrospective analysis. Hong Kong Physiother J 2013;31:36-40.
3. Maqsood M, Ali N, Bhat A, Bangroo FA, Dhanda MS, Singh R. Current trends of major lower limb amputations at a tertiary care centre of Jammu, India. Int J Med Sci Res Pract 2015;2:77-80.
4. Unnikrishnan EP, Rollands R, Parambil SM. Epidemiology of major limb amputations: A cross sectional study from a South Indian tertiary care hospital. Int Surg J 2017;4:1642-6.
5. O'Keeffe B, Rout S. Prosthetic rehabilitation in the lower limb. Indian J Plast Surg 2019;52:134-43.
6. Wilson AB Jr. B. S. M. E-History of Amputation Surgery and Prosthetics. Atlas of Limb Prosthetics: Surgical, Prosthetic, and Rehabilitation Principles. Ch. 1. p. 1-14. Available from: www. oandplibrary.org/alp/chap01-01.asp.
7. Webster JB, Poorman CE, Cifu DX. Guest editorial: Department of veterans affairs amputations system of care: 5 years of accomplishments and outcomes. J Rehabil Res Dev 2014;51:vii-xvi.
8. Gailey RS, Roach KE, Applegate EB, Cho B, Cunniffe B, Licht S, *et al*. The amputee mobility predictor: An instrument to assess determinants of the lower-limb amputee's ability to ambulate. Arch Phys Med Rehabil 2002;83:613-27.
9. Varma P, Stineman MG, Dillingham TR. Epidemiology of limb loss. Phys Med Rehabil Clin N Am 2014;25:1-8.
10. Esquenazi A. Amputation rehabilitation and prosthetic restoration. From surgery to community reintegration. Disabil Rehabil 2004;26:831-6.
11. Dinesh M. A report on amputees in India. Orthot Prosthet J 1986;40:16-32.
12. Sabut RK, Mohanty RC. Polycentric prosthetic knee joint: A Review. Int J Eng Sci 2017;6:503-10.
13. Sahu A, Sagar R, Sarkar S, Sagar S. Psychological effects of amputation: A review of studies from India. Ind Psychiatry J 2016;25:4-10.
14. Uchytil J, Jandačka D, Farana R, Zahradník D, Rosicky J, Janura M. Kinematics of gait using bionic and hydraulic knee joints in transfemoral amputees. Acta Gymnica 2017;47:130-7.
15. Raichle KA, Hanley MA, Molton I, Kadel NJ, Campbell K, Phelps E, *et al*. Prosthesis use in persons with lower- and upper-limb amputation. J Rehabil Res Dev 2008;45:961-72.
16. Hawkins AT, Pallangyo AJ, Herman AM, Schaumeier MJ, Smith AD, Hevelone ND, *et al*. The effect of social integration on outcomes after major lower extremity amputation. J Vasc Surg 2016;63:154-62.

17. Singh G, Pithawa AK, Ravindranath G. Study of disabled treated at Artifical limb centre. Med J Armed Forces India 2009;65:232-4.
18. Asano M, Rushton P, Miller WC, Deathe BA. Predictors of quality of life among individuals who have a lower limb amputation. Prosthet Orthot Int 2008;32:231-43.
19. Kashif AW, Walia TS, Salujha SK, Chaudhury S, Sudarsanan S, Raju M, *et al*. Effect of short-term psychiatric intervention in amputees. Med J Armed Forces India 2004;60:231-4.
20. Sinha R, van den Heuvel WJ, Arokiasamy P. Factors affecting quality of life in lower limb amputees. Prosthet Orthot Int 2011;35:90-6.
21. Chamlian TR. Use of prostheses in lower limb amputee patients due to peripheral arterial disease. Einstein (Sao Paulo) 2014;12:440-6.
22. Fiedler G, Akins J, Cooper R, Munoz S, Cooper RA. Rehabilitation of people with lower-limb amputations. Curr Phys Med Rehabil Rep 2014;2:263-72.
23. Kannenberg A, Zacharias B, Pröbsting E. Benefits of microprocessor-controlled prosthetic knees to limited community ambulators: Systematic review. J Rehabil Res Dev 2014;51:1469-96.
24. Ziegler-Graham K, MacKenzie EJ, Ephraim PL, Travison TG, Brookmeyer R. Estimating the prevalence of limb loss in the United States: 2005 to 2050. Arch Phys Med Rehabil 2008;89:422-9.
25. Girijala RL, Bush RL. Review of socioeconomic disparities in lower extremity amputations: A continuing healthcare problem in the United States. Cureus 2018;10:e3418.