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## RESEARCH REPORT

# Prevalence and aetiology of amputation in Kolkata, India: A retrospective analysis

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*Department of Physiotherapy (Post Graduate Section), National Institute for the Orthopaedically Handicapped, Kolkata, West Bengal, India***KEYWORDS**amputation;  
cause of amputation;  
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competence

**Abstract** This study is an epidemiological report of the medical records of amputees in Kolkata, West Bengal, India. This retrospective study included 155 amputees who had undergone an amputee physiotherapy rehabilitation program and prosthetic training at the National Institute for the Orthopaedically Handicapped in Kolkata, West Bengal, from January 2008 to January 2010. The paper reports on the prevalence, aetiology, and levels of amputation. The causes of amputation classified under vascular diseases, trauma, and carcinoma are discussed. The most common cause of amputation was trauma (70.3%), the second most common cause being peripheral vascular disease. Lower limb amputation, more common than amputation at the upper limb, accounted for 94.8% of all amputations.

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## Introduction

An estimated 10% of the world's population experiences some form of disability or impairment [1]. The term "disability" has many different meanings; the Global Burden of Disease, however, uses the term "disability" to refer to loss of health, where health is conceptualized in terms of functioning capacity in a set of health domains such as mobility, cognition, hearing, and vision [2].

The number of people with disabilities is increasing due to population growth, ageing, the emergence of chronic diseases, and medical advances that preserve and prolong

life, creating overwhelming demands for health and rehabilitation services [3]. In South-East Asia, the prevalence of disability ranges from 1.5% to 21.3% of the total population, depending on the definition and severity of disability [4]. Despite the increase in prevalence of disability worldwide, not much attention has, for various reasons, been paid to its evaluation, management, and prevention [5].

Amputation is one of the most ancient of all surgical treatments, its history dating back as far as the 16th century. Ambroise Paré was the first to use ligatures to control bleeding after amputation and also designed relatively sophisticated prostheses [6]. The increase in the number of amputees seen today has resulted from improvements in transportation methods [7], the development of mechanical civilization, and the prolongation of life [6]. Epidemiological research on amputees is being extensively carried out in many countries all over the world. [6]

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After studying the causes of amputation in young men from Illinois, USA, Lambert and Sciora found that trauma was the most common, accounting for 52% of all amputations [8]. Later, Warren and Kihn (1968) reported that 76% of 1964 amputees who received treatment at the Veterans Administration Hospital had undergone amputation because of vascular insufficiency [9]. Still later, Stewart and Jain (1993) reported that the majority of amputations in Scotland, UK, were caused by peripheral vascular disease, especially arteriosclerosis [10]. Putting these reports together, it is possible to conclude that, in developed countries, the most common cause of amputation is peripheral vascular disease.

The picture may, however, be different for a developing country such as India. Therefore, the object of this study was to investigate the cause of amputation, the site of amputation, the distribution of amputees among the different age groups, and the effects of these amputations on functional competence using a study sample in Kolkata, India.

## Methods

### Subjects

A retrospective study was carried out on patients who had undergone the prosthesis and amputation rehabilitation program at the Indoor Physiotherapy Department of the National Institute for the Orthopaedically Handicapped (NIOH) from January 2008 to January 2010. Among 164 patients, nine were excluded because of incomplete or lost medical records. Therefore, 155 patient records were included in this study.

### Data collection

The data were obtained from the NIOH database after having obtained approval from the Institute. Since it was a retrospective study that involved reviewing the medical records only, no informed consent was required. Data included demographic factors and general patient characteristics including age, sex, and reason for amputation.

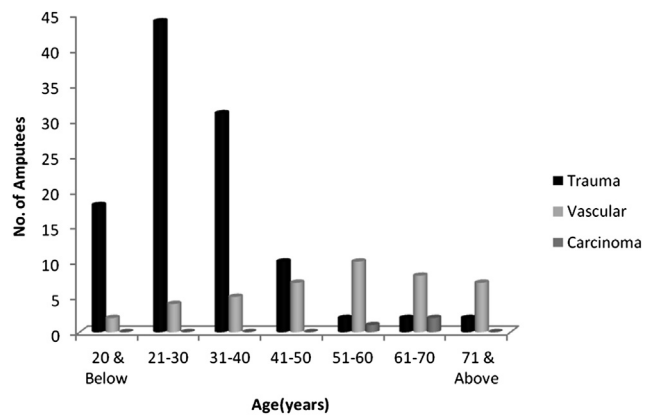
### Data analysis

All data were analyzed by descriptive statistics using SPSS (version 14, IBM Corporation & SUN Microsystems Inc., Chicago) statistic analysis software.

## Results

### Patients' demographic data

The age of the amputees ranged from below 20 years to above 70 years. The most common age group for amputation was 21–30 years of age (Fig. 1), accounting for 32.0% of all amputees. The 31–40-year age group was second, accounting for 23.2% of all amputees, and the 20 years and below age group was third (14.2%). There were more male amputees than female ones, with 86% of all amputees being men.



**Figure 1** Prevalence of amputation by age. Amputations due to trauma were most common in the 21–30-year age group, whereas those due to vascular causes were most prevalent among those over 50 years of age.

### Causes of amputation

In this study, out of 155 amputation cases, 109 patients (70.3%) were victims of trauma, making this the most common cause of amputation. Trauma was the leading cause of amputation in all age groups except for those in their 60s. In fact, in each of the younger groups from the teens to the 30s, amputation due to trauma accounted for more than 70% of all amputations. The common traumas reported were road traffic accidents, railway accidents, and burns due to fire, electrocution, and chemical injuries.

The next most common cause of amputation was peripheral vascular disease (27.7%). Cases of amputation for peripheral vascular disease tended to increase in parallel with age. In the group aged over 60 years, peripheral vascular disease (34.9%) was a more common cause of amputation than trauma (3.6%).

Three patients had a history of amputation due to malignancy, two of them being in their teens.

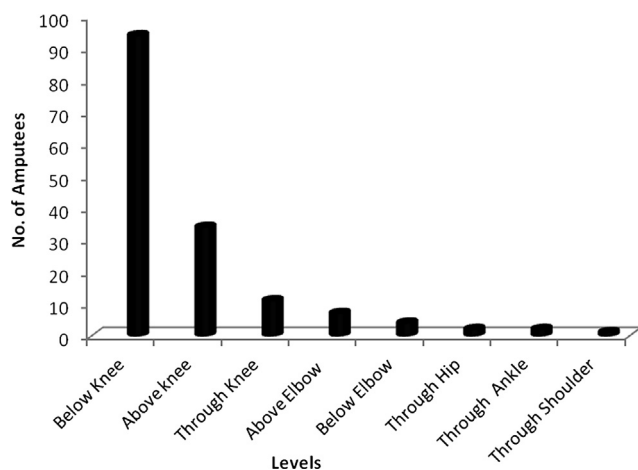
### Site of amputation

Lower limb amputations were much more common than upper limb amputations, the former accounting for 94.8% of all amputations, and the latter for only 5.2%. Among all lower limb amputation cases, below-knee amputations were the most common, followed by above-knee amputations (Fig. 2).

## Discussion

According to Metz, the global prevalence of disability is 4% in developing countries and 7% in industrialized countries [11]. The prevalence of disability in India according to a census report in 2001 is 1.8–2.2% [12]. According to the National Sample Survey Organization, the state of West Bengal ranks second in terms of prevalence rate and third in incidence rates of disability among the major Indian states [13].

The present study was a hospital-based, retrospective study based in Kolkata, West Bengal, which has



**Figure 2** Prevalence of amputation by site. Lower limb amputation was far more common than upper limb amputation, below-knee amputation being the most common type of amputation.

experienced social changes including rapid industrial development. In this study, the younger age groups from the teens to the 30s accounted for 46.2% of participants, thus making up the leading amputation age group. This grouping is similar to that of Obalum and Okeke, who investigated only lower limb amputees and reported that the peak age of amputation was the 21–30-year group [14]. The amputees in this report were younger. This may be due to the fact that most amputations were due to trauma, which occurred more frequently in younger people who led more active lives.

Reports on the causes of amputation differ from country to country. Sansam et al reported in 2009 that trauma accounted for the majority of amputations in India, and dysvascularity was the predominant cause in most developed countries [15]. Sujatha [7] also stated in her study at the Government Institute of Rehabilitation Medicine, K.K. Nagar in Chennai, that the majority of patients lose their limbs due to road accidents. Amputation due to complications resulting from diabetes was ranked second. She also compared her study to work from Punjab and Andhra Pradesh and found that the results were consistent. Similar findings were seen in this study in Kolkata, where amputation caused by trauma accounted for 70.3% of all cases, while peripheral vascular disease accounted for 27.7%, making trauma the undoubted primary cause of amputation.

The leading causes of amputation in different countries are influenced by the degree of industrialization, the transportation system, and the medical care available. In Kolkata, it seems that trauma is the leading cause of amputation because of its rapid development into a more industrial and mechanized state since 1947, and the increase of the volume of traffic, along with its increased speed. This is similar to the findings of Lento [16], who concluded that traumatic amputation was more frequent than vascular amputations in developing countries compared with developed countries, likely because of the lower incidence of obesity and resultant diabetes in such

countries, as well as the higher exposure to farming equipment, which frequently causes limb amputations. Traumatic amputations can result from the use of power saws and other heavy machinery, as well as electrocution or burns. Motor vehicle collisions (including motorcycles), gunshot wounds from violence, and animal attacks also contribute to traumatic limb amputations.

Looking at the cause of amputation according to age, Lento [16] and Ephraim and Duncan [17] reported that peripheral vascular disease occurred mainly in the senior age group, especially in those aged 60 years or above. These reports are consistent with this study, which shows that amputation because of accidents occurred relatively more often in the younger age groups, while cases due to peripheral disease were more frequent in the 60s and older age group.

Cases of amputation due to malignancy were most common in the teen age group compared with the other age groups. This seemed to be due to the pattern of osteogenic sarcoma, a malignancy that occurs mainly in younger years [18].

Lower limb amputation accounts for 94.8% of all amputations. This is similar to the figures reported by Obalum and Okeke [14] and Lento [16], which stated that lower limb amputations were found more commonly than upper limb amputations. Among those lower limbs amputations, the most frequent site of amputation was transtibial. This may be because the distal portion of a limb is generally more likely to be injured, and surgeons tend to amputate as distally as possible to enhance functional activity. In amputation cases due to malignancy, however, transfemoral amputation was most common.

### Effect of amputation on functional competence

Different prevalence rates for disability are available in India. According to the Census 2001 [12], there were 21 million people with disabilities in India, who constituted 2.13 % of the total population; the total figure includes persons with visual, hearing, speech, locomotor, and mental disabilities. Prevalence rates have shown declining trends during 1991–2002 for all disability types except locomotor disability [13]. One of the major reasons for this might be increasing trends of amputation in India.

According to the guidelines and gazette notification issued by Ministry of Social Justice and Empowerment on June 13, 2001 [19], Permanent Physical Impairment (PPI) for various levels of amputation is as follows: below-knee amputation, 70%; through-knee amputation, 75%; above-knee amputation, 85%; below-elbow amputation, 70%; above-elbow amputation, 85%; through-hip amputation, 90%; through-shoulder amputation, 90%; and through-ankle amputation, 55%.

According to this classification, a person with lower limb amputation has a PPI of 70% and above (except for through-ankle and Syme's amputations). Compared with the general population in the United States, amputees were more likely to report a need for the help of another person in one or more activities of daily living [17]. Hence, it can be concluded that lower limb amputation not only affects people's ability to walk, but may affect their participation

in valued activities, their body image perception, and their quality of life, which is significantly associated with mobility. The reduced ability to walk with a prosthesis is associated with lower activities of daily living scores and a lower level of social activity.

In our present study in Kolkata, 94.8% of the amputation population consisted of lower limb amputees, the most common age group affected by amputation being those in their 20s and 30s. Therefore it can be concluded that the functional competence as well as the productivity of the most active age group of Kolkata will be immensely reduced.

An association between the cause of amputation and walking potential was found in a study conducted by the researchers at Johns Hopkins University [17], in collaboration with the Amputee Coalition of America. It was stated that participants who had undergone amputation due to diabetes or vascular-related causes were twice as likely to report being retired due to a disability than those with traumatic amputation, regardless of their age or the time since amputation.

In the present study, the percentage of the amputation population affected by dysvascularity was 27.7%, the majority belonging to the age group above 50 years of age. Therefore the functional activity of this age group would be much less reduced than that of the traumatic amputees. Furthermore, it can be said that since the amputation caused by dysvascularity mostly occurred after the age of 50 years, that is, at retirement age, the economic burden caused by amputation would therefore be much less than that related to amputation in patients in their 20s and 30s.

For people with limited mobility, environmental barriers include not only physical and structural barriers, such as uneven pavements or poorly lit areas, but also societal and psychological barriers such as discrimination and attitudes, which limit a person's ability to do the things they want to do and therefore drastically reduce the functional competence of the amputation population.

In the present study, it was found that trauma was the leading cause of amputation among the younger age group. Hence, productivity at work as well as sense of wellbeing would affect the younger age group more than the aged amputee population. This conclusion was again similar to that of the researchers at Johns Hopkins University [17].

## Limitations

Even though this study was carried out in one of the leading Central Government Institutes of Kolkata, it did not take into account the data from all the hospitals of the entire state of West Bengal.

In addition, a direct analysis of the amputees' functional competence could not be carried out as it was beyond the scope of this study. Had it been possible, the exact status of their functional level after prosthetic training would have been clearer.

## Conclusion

Putting the results of this study together, statistics similar to those from other Indian states as well as other

developing countries were found in this study. Trauma was the leading cause of amputation. A large number of working-age amputees reported being retired due to disability, thus reducing their productivity mainly in their most active years of life. The functional competence of a large proportion of the population (46.2%) consisting of the younger age group in their 20s and 30s was reduced in either their daily or social activities, which might lead to an increase in the economic burden on the state.

We hope that this study on amputees in Kolkata will shed light on the need to implement more stringent road and rail safety measures. It is important to realize that most amputations occurring as a result of trauma can be avoided. Developing awareness programs for early rehabilitation as well as early prosthetic fitting can prevent the amputee population from becoming a burden on the state.

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