FREQUENCY AND THE RELATED SOCIO-DEMOGRAPHIC AND CLINICAL FACTORS OF PHANTOM LIMB PAIN IN TRAUMATIC AMPUTEES PRESENTING AT A TERTIARY CARE REHABILITATION SETUP

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ABSTRACT

Objective: To find out the frequency of phantom limb pain (PLP) in a sample of Pakistani amputee population presenting with amputation due to trauma and to investigate its relationship with different socio-demographic and clinical factors.

Study Design: A cross-sectional descriptive study.

Place and Duration of Study: Armed Forces Institute of Rehabilitation Medicine, Rawalpindi from August 2010 to October 2013.

Material and Methods: Through non-probability purposive sampling, patients of both genders and all ages having a traumatic etiology of amputation were sampled from the outdoor amputee clinic and the indoor amputee ward. Patients having diabetes mellitus, polyneuropathy, memory loss, cognitive deficits and established history of psychiatric disorders were excluded. Through face to face semi structured interviews, information was obtained about presence of PLP, gender, location (urban or rural), ethnicity based on Pakistani provinces (Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, Azad Jammu and Kashmir), monthly income in Pakistani Rupees (PKR) (<10,000, 10,000 – <50,000 and >50,000), level of education (grade <5 , grade 5 – 10, and grade >10), level of amputation and cause of trauma (fall from height, motor vehicle accident, blast injury, bullet injury or others).

Results: Out of 268 patients (mean age 28 ± 6 years), 266 (99.3%) were male and 2 (0.7%) were female. Majority (79.1%) were rural based, Punjabis (44.8%), had a monthly income <10,000 PKR (85.4%), education from grade 5 – 10 (80.2%) and a lower limb amputation (86.9%). The commonest cause was blast injuries (72.8%). PLP was present in 42.5% (n=114) of the individuals and it was not significantly related to gender, living location, ethnicity based on Pakistani provinces, level of education, monthly income, cause of traumatic amputation and level of amputation.

Conclusion: PLP was found in 42.5% of our sample of Pakistani traumatic amputees. The frequency was not related to gender, monthly income, ethnicity based on provinces, education, rural or urban based living and etiology or level of amputation.

Keywords: Amputation, Demographics, Phantom limb pain.

INTRODUCTION

Amputations are a harbinger of numerous secondary complications among which pain is the foremost complaint. Identifying the etiology of such pain is often challenging because of overlapping symptoms from different sources. The initial decision required in addressing pain complaints is to differentiate phantom limb pain (PLP) from residual limb pain (RLP)[1]. PLP is defined as any sensation in the amputated part of the extremity, which is so intense that it is experienced as painful[2]. RLPis defined as any painful sensation localized in the stump[3].

Ambroise Paré (1510-1590) was the first person to give a medical description of PLP, however, the term “phantom pain” was coined and popularized in 1871 following a publication by Silas Weir Mitchell[4,5]. The pathophysiology of PLP has not been fully clarified, yet clinical and experimental studies have contributed significantly toward understanding of this phenomenon and both central and peripheral theories have been developed[6-8]. Numerous factors have been linked to the development of

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PLP that include age, cause of amputation, pain prior to amputation, time elapsed since amputation, presence of phantom limb sensations or RLP and use of prosthesis[3,9-10].

Table-1: Demographic features of the sample.

Demographic features	n (%)
Gender: Male / Female	266 / 2 (99.3:0.7)
Location of living: Rural / Urban	212 / 56 (79.1 / 20.9)
Province of living	
Punjab	120 (44.8)
Sindh	25 (7.5)
Khyber Pakhtunkhwa	100 (37.3)
Balochistan	3 (1.1)
Azad Jammu & Kashmir	20 (7.5)
Monthly income (PKR)	
<10,000	32 (11.9)
10,000 - <50,000	229 (85.4)
>50,000	7 (2.6)
Level of education	
Grade < 5	10 (3.7)
Grade 6-10	215 (80.2)
> 10 grades	43 (16)

PKR: Pakistani Rupee.

The therapeutic management of PLP may be divided into three modalities, pharmaceutical, supportive, and surgical. These may be implemented in combination or separately. The pharmacotherapy of PLP is diverse including tricyclic antidepressants, sodium channel blockers, anticonvulsants, anesthetics, calcitonin, opioids and non-steroidal anti-inflammatory drugs. Supportive treatment includes non-invasive techniques such as transcutaneous electrical nerve stimulation, acupuncture, biofeedback, vibratory therapy and hypnosis. Surgical management is seldom used as results have been unsatisfactory[11].

In the present study, we primarily determined the frequecy of PLP in a sample of multiethnic Pakistani population presenting with amputation due to trauma. The different etiologies of trauma and the relationship of different socio-demographic and clinical factors to the presence of PLP were also investigated.

MATERIAL AND METHODS

It was a cross-sectional, observational study carried out at Armed Forces Institute of Rehabilitation Medicine, Rawalpindi from August 2010 to October 2013. Amputees of both genders and any age having a traumatic etiology of amputation were included and those suffering from diabetes mellitus, polyneuropathy, memory loss, cognitive deficits or having established history of psychiatric disorders were excluded. The patients were sampled via nonprobability purposive sampling from the outdoor amputee clinic and the indoor amputee ward. PLP was defined as pain experienced in the amputated part of the limb.

Face to face semi structured interviews were conducted. Verbal informed consent was taken from all the participants.Information was documented in a structured questionnaire. The participants were then asked about location of living (urban or rural), ethnicity based on Pakistani provinces (Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, Azad Jammu and Kashmir), monthly income in Pakistani Rupees (PKR) (<10,000, 10,000 – <50,000 and >50,000), level of education (grade <5 , grade 5 – 10, and grade >10), level of amputation (upper limb and lower limb amputation as well as further

amputation levels mentioned in table-2 and cause of trauma (fall from height,motor vehical accident, blast injury, bullet injury or others). Data were analyzed using SPSS, version 20.0 (IBM Corp, Armonk, NY, USA). Mean and standard deviation were calculated for age.

Table-2: Frequency of phantom limb pain and comparison of different demographic and clinical factors based on phantom limb pain.

Characteristics	Present n (%)	Absent n (%)	*p*-value (2-tailed)
Gender			
Male	113 (42.5)	153 (57.5)	0.83
Female	1 (50.0)	1 (50.0)	
Total	114 (42.5)	154 (57.5)	
Location of living			
Rural	90 (42.5)	122 (57.5)	0.96
Urban	24 (42.9)	32 (57.1)	
Province of living			
Punjab	51 (42.5)	69 (57.5)	0.93
Sindh	9 (36.0)	16 (64.0)	
Khyber Pakhtunkhwa	45 (45.0)	55 (55.0)	
Balochistan	1 (33.3)	2 (66.7)	
Azad Jammu and Kashmir	8 (40.0)	12 (60.0)	
Monthly income (PKR)			
<10,000	11 (34.4)	21 (65.6)	0.47
10,000 to 50,000	99 (43.2)	130 (56.8)	
>50,000	4 (57.1)	3 (42.9)	
Cause of trauma			
Motor vehicle accident	17 (50.0)	17 (50.0)	0.72
Blast injuries	83 (42.6)	112 (57.4)	
Falls from height	0 (0.00)	1 (100.0)	
Gunshot injuries	10 (38.5)	16 (61.5)	
Other causes	4 (33.3)	8 (66.7)	
Level of amputation			
Partial foot amputation	4 (17.4)	19 (82.6)	0.07
Syme's amputation	7 (38.9)	11 (61.1)	
Transtibial amputation	69 (46.30	80 (53.7)	
Knee disarticulation	4 (57.1)	3 (42.9)	
Transfemoral amputation	19 (54.3)	16 (45.7)	
Partial hand amputation	1 (20.0)	4 (80.0)	
Transradial amputation	3 (33.3)	6 (66.7)	
Transhumeral amputation	6 (46.2)	7 (53.8)	
Multiple levels of amputation	1 (11.1)	8 (88.9)	
Upper or lower limb			
Upper limb	10 (37.0)	17 (63.0)	0.17
Lower limb	103 (44.2)	130 (55.8)	
Both	1 (12.5)	7 (87.5)	
Level of education			
Grade <5	2 (20.0)	8 (80.0)	0.25
Grade 6-10	91 (42.3)	124 (57.7)	
> 10 grades	21 (48.8)	22 (51.2)	

PKR: Pakistani Rupee

Frequencies were calculated and compared for groups based on gender, location of living, ethnicity based on Pakistani provinces, monthly income, literacy level and cause of trauma. The data are presented as tables and figures. Pearson's Chi-square analysis was used to identify the factors significantly associated with PLP. A *p*-value <0.05 was considered significant.

RESULTS

Of 268 patients (mean age: 28±6 years, range: 15-55 years), 266(99.3%) were male and 2 (0.7%) were female. Most patients were from rural areas (79.1%), belonged to Punjab province (44.8%), had education from grade 6-10 (80.2%) and monthly income 10,000-50,000 PKR (85.4%) (table-1). Two hundred and thirty-three (86.9%) patients had lower limb amputations and 27 (10.1%) had upper limb amputations while 8 (3%) had amputations in upper as well as lower limbs. Thirty-four (12.7%) individuals were victims of motor vehicle accidents, 195 (72.8%) of blast injuries and 26 (9.7%) of bullet injuries. One (0.4%) patient had a fall from height and 12 (4.5%) had other causes of trauma. The distribution of etiology among amputees with upper or lower limb amputation is given in the figure. The different levels of amputation found in the database are presented in table-2. PLP was present in 42.5% (n=114) of the individuals.

PLP was more common in females, in patients who were from Khyber Pakhtunkhwa and urban based, having education grade >10 and monthly income >50,000 PKR. PLP was also more common in lower limb amputees with a knee disarticulation and motor vehicle accident as the etiology of amputation. (table-2) No statistically significant association of PLP was observed with any of the sub-groups of above mentioned variables.

DISCUSSION

PLP is a painful sensation in a body part that is no longer present. It is primarily described as knife-like, burning, squeezing or throbbing. The phenomenon is usually related to tissue injury, development of a scar or neuroma and is often exacerbated by pressure and other mechanical factors such as wearing a prosthesis[12]. PLP can extremely debilitate the amputees and greatly affect their activities of daily living[13]. The underlying pathophysiology is unclear, however it is generally accepted that both nociceptive and neuropathic processes are involved. It is also recognized that most of the treatments have proved ineffective andonly a few amputees become pain free[14].

The current geopolitical situation of Pakistan has created an environment of increased security threat in the form of improvised explosive device (IED) and suicide bomb blasts as well as physical raids by terrorists on military and civilian targets in the low intensity conflict zone of Federally Administered Tribal Areas and Balochistan. Such attacks have left thousands dead and disabled, with amputation being the commonest disability. In the backdrop of above situation, a detailed study on amputees was deemed necessary to improve the health and rehabilitative services being offered to them. The primary aim of this study was to determine the frequency of PLP amongst multiethnic Pakistani post-traumatic amputation patients with a secondary aim of identification of the risk factors of PLP in these patients.

The majority of our sample was male because most patients were from the military background. The sample comprised of young people and was complemented by previous studies on traumatic amputees, which also concluded that traumatic amputations mostly occur in young people[15].

Amputations due to trauma are more common in lower limbs than upper limbs. Studies done in war-hit city of Kabul discovered that most amputations resulting from trauma primarily involved the lower limbs[16]. Our study produced similar results, as 86.9% of the sample had lower limb amputation.

In terms of causes of trauma, blast injuries were the most frequent cause (72.8%) of amputation in our study followed by motor vehicle accidents (12.7%) and gunshot injuries (9.7%). Comparable findings have been observed in studying regional amputee database. According to the databank of Indian

Armed Forces, maintained from 1944 to 2003, mine blast injuries constituted the largest number of cases in traumatic amputations (41.74%) followed by motor vehicle accidents (21.79%) and gun-shot injuries (9.29%)[17]. The Afghani database developed after start of war on terror reported mine blast injury to be the commonest reason in such amputations[15]. carried out in India reported transtibial amputation followed by transfemoral amputation as the commonest levels of traumatic amputation[17]. Studies from Sri Lanka and Cambodia showed a frequency of 73% to 63% for transtibial amputation in mine wounded amputees[18,20]. The high proportion of these amputation levels have also been reported

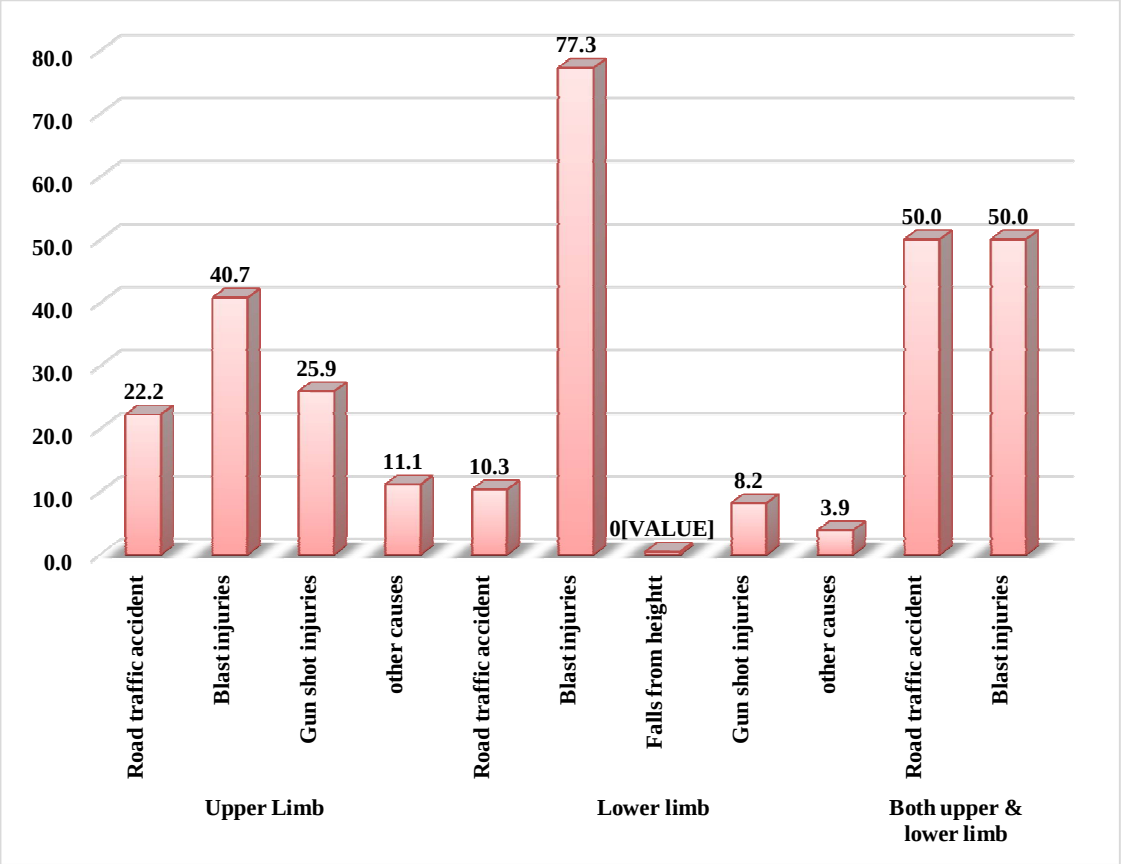

Figure: Percentage etiology in general levels of amputation.

Similarly, in Sri Lanka, antipersonnel mines have been found to be the leading cause in war-related amputations from two different localities (95% and 62.4% respectively) followed by gunshot injuries in 25.8% and 11.8% respectively[18]. Likewise, the United States military database recorded between 2001 and 2009, established that the majority (50%) were wounded by blasts caused by IEDs[19].

Majority of the earlier studies have reported transtibial and transfemoral amputations as the most frequent level in traumatic amputations. The largest study by Rotter et al., Ebskov et al. and Pezzin et al[21-23]. In our study transtibial amputation was the most frequent level (56%) followed by transfemoral amputation (13.1%).

We discovered that PLP was present in 42.5% of the amputees. Lower limb amputees had a higher percentage of PLP (44%) than the upper limb amputees (32.4%). A study carried out in Singapore found incidence of PLP to be 27%[24]. Richardson and colleagues discovered prevalence of PLP in lower limb amputees to be 54%[25]. In most studies performed mainly on Caucasian populations and patients whose

amputations were a result of traumatic injuries the incidence of PLP was found to range from 47% to 79%[11, 26-32].

Regarding influence of socio-demographic and clinical factors, we did not find any significant relation of PLP with gender, educational level, monthly income, living location, ethnicity based on Pakistani provinces and etiology or level of amputation. Research of previous literature delivers varied findings when PLP development is compared to socio-demographic factors. According to Sin and colleagues, development of PLP was significantly associated with the etiology and level of amputation (p=0.03 and 0.01 respectively) but not with ethnicity or gender (p=0.49 and 0.19 respectively)[24]. Gallagher et al. found a positive association of PLP with transfemoral level of amputation[33]. Sherman et al. stated that report of PLP was not related to original cause of amputation[34]. Jensen et al. reported no relationship of gender or level of amputation with the development of PLP[35]. Most other studies have reported the occurrence of PLP to be independent of the level of amputation[3,10,36]. We could not find any study correlating urban vs rural place of residence, educational status or financial capability with the development of PLP.

The study had few limitations. The sample in this study was tilted towards younger adults who had a traumatic amputation, whereas the majority of amputations arises from peripheral vascular causes and occurs primarily in the elderly. The sample therefore restricted the generalizability of our findings. However, it is important to note that this research contributed to whatis already known about PLP and formed a basis upon which future research can be based. Further research with larger and varying samples and comparison of findings in traumatic versus non-traumatic causes of amputation is recommended.

CONCLUSION

PLP was found in 42.5% of our sample of Pakistani traumatic amputees. The prevalence was not related to gender, monthly income, living location, ethnicity based on Pakistani provinces, education, rural or urban based living or level of amputation.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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