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Agony of Phantom pain and Residual Limb Pain among Lower Limb amputees - A tertiary care hospital based Study.

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Abstract

Present study describe the prevalence and characteristics of phantom limb pain, residual limb pain, and other site pain, and depressed mood may contribute to the experience of pain in the lower limb amputee. Hospital based, cross-sectional study was conducted at S.M.S hospital, Jaipur (a tertiary care hospital, at Rajasthan, India). Participants completed an amputation pain questionnaire that included several standardized pain measures. prevalence, intensity, duration, frequency and quality of phantom limb pain, residual limb pain and other site pain, and depressed mood as measured by the center for epidemiologic study depression scale, and Socio-demographic characteristics of the lower limb amputee. About all amputees interviewed reported experiencing one or more type amputation related pain in the previous 4 weeks. Phantom limb sensation was reported most often, with phantom limb pain, residual limb pain, with other site pain among majority of participants. Half proportion of persons with phantom pain and residual limb pain reported experiencing moderate pain. Identifiable risk factors for intensity and frequency of amputation related pain varied greatly by pain site. However, across all pain types, depressive symptoms were found to be a significant predictor of level of pain intensity and frequency. This study could assist for the prevalence and risk factors for Phantom limb pain and residual limb pain following lower limb amputation in Indian scenario. Improved understanding of the prevalence of various post amputation pain and its characteristics may help to improve the care, Rehabilitation of amputees and planning appropriate interventions for this major challenge.

Keywords: Amputation, Depression, Phantom Pain, Rehabilitation, Residual Pain.

Introduction

Phantom limb pain and residual limb pain have received the majority of attention in the literature on amputations (also referred to as stump pain). [1] The amputee may attempt to stand or walk on the extremity since the sensation is so intense. For many generations, researchers have argued about the reasons of phantom limb sensation and pain, which have been variously linked to central nervous system changes, peripheral illnesses before and after amputation, and psychological variables. The thalamus's maladaptive rearrangement and the somatosensory and motor cortex's representation of the body are related to phantom limb pain. [2-3] There are many different types of phantom sensation, such as touch, pressure, cold, itching, tickling, or tiredness. [4] Phantom sensations is a universal trend, but phantom pain is not. The first week following amputation is when pain usually starts to manifest, but it can also happen months or years afterwards. Phantom limb pain can vary in intensity, frequency, period of episodes, and type of pain sensed. Many people describe the pain as being like a knife, sticking, burning, or squeezing, and some people even state it has an electrical sensation. [5-7]

Attention, emotions, pressure applied to the stump, temperature changes, autonomous reflexes, and pain from other sources are some elements that might exacerbate the pain severe. Rest, diversion, wearing a prosthetic, raising the stump, and percussion and stump massage are the techniques that can reduce pain, nevertheless. [8, 9]Because there are conflicting descriptions in the literature, it is uncertain how prevalent phantom limb pain is among patients who have had amputations. While some studies report a high prevalence of 85% [6, 10] and a study has reported a very low prevalence of 33%.[11] Incorrect prosthesis fitting, neuroma formation, reflex sympathetic dystrophy, adherent scar, or sepsis are the most frequent causes of residual limb pain.[1] Residual limb pain is common immediately following amputation but is typically believed to significantly decrease in a few weeks concurrent with surgical healing.[1,9]

Compared to the general population, people who have had a lower limb amputated appear to have back pain more frequently. [12] Chronic low back pain may be caused by bio-mechanical variables including leg length disparity, spine motions during prosthetic gait, prosthesis type, and strength loss. [13,14] Hip, knee, and contra lateral limb pain are additional forms of pain that have undergone less investigation.

It has been demonstrated that amputees with chronic pain report much more disability than people without pain.[15] Depressed mood and clinical depression following limb loss have been reported to range from 35% to 51.4%. Limitations in activity, time since amputation, and age have been shown to be a significant predictor of poor psychological adjustment following the limb loss.[16] But little is known about the correlations between phantom pain and depression.

In order to inform scholars, doctors, policy makers, and the general public on the impact of illness to society, prevalence studies are essential. Only a few studies used data from the Asian population; the majority of the studies used data from the Caucasian population. After lower limb amputation, increasing our understanding of the burden of chronic pain and the factors that contribute to the experience of chronic pain can result in the development of new and improved rehabilitation techniques and an improvement in quality of life.

Materials & Methods

In this descriptive type observational study, patients with lower limb amputees were interviewed in the out patients door of department of physical medicine and rehabilitation of Sawai Man Singh hospital. Patients were

randomly recruited between June 2020 and November 2021. All participants were approached by investigator himself and were explained about nature and purpose of study.

Participants with lower limb amputation unilateral or bilateral of both genders, aged 18 years or older with cognitive level sufficient to understand the assessment, time since amputation 6 month or more were included.

Sample size was calculated at 95% confidence level assuming 72% prevalence of phantom pain in lower limb amputees. At the absolute allowable error (precision) of 5% of prevalence, minimum 310 lower limb amputees were required for Sample size.

After obtaining informed written consent, participants were interviewed about presence of phantom limb sensation, phantom pain and residual limb pain and presence of other anatomical side's pain in previous 4 weeks. Frequency and duration of each type of pain was noted. Frequency was categorized as never, Intermittent and constant. Intensity of phantom pain and residual limb pain was quantified in 10 -point numeric rating pain scale (NRS) and further classified into 3 categories: mild (rating 1-4), moderate (rating 5-6) and severe (rating 7-10).

Presence of depressed mood in participants was assessed by using the 20 item Centers for Epidemiologic Studies Depression Scale (CES-D) with response value on 4-point Likert scale that range from 0 (none or less than one day) to 3 (3-5 days a week). Final score ranged from 0 to 60, with a higher score indicating greater impairment. Cutoff score for presence of depressed mood is 16. Additional measures of lower limb amputees including demographic information (age, sex, socioeconomic status, community types, marital status and occupation) and amputation specific measures (etiology, amputation level, time since amputation and prosthesis use) were covered. Following standard examination practices, local clinical examination of stump was did by investigator himself. All findings thus collected were recorded in a pre-designed semi-structure study proforma and were entered into Microsoft Excel sheet to prepare master chart. This master chart was subjected to statistical analysis later on.

Exclusion criteria

1. They have evidence of disease, trauma, or surgery in the central or peripheral nervous system.
2. Patients have current skin or soft tissue infection at stump site.
3. Time since amputation less than 6 months.
4. Severely ill patients.
5. Non-cooperative patients.

Statistical analysis

Linear variables were summarized as mean and standard deviation whereas nominal/categorical variables were presented as proportions. Unpaired T-test, Pearson's correlation coefficient and other parametric test were used for analysis of linear variables while nominal/categorical variables were analyzed by using Chi-square test and Fisher exact test. Ordinal variables were expressed as median and range and analyzed by using Mann Whitney test, Spearman correlation and other parametric test. P-value <0.05 was taken as significant. MEDCALC 19.4 version software was used for all statistical calculations.

Results & Discussion

Mean age of study subjects was 47.78 ± 13.73 years, ranging from 18 - 76 years. Most of the subjects belonged to 21-30 years (29.7%). Majority of participants in study were male (80.3%). Most of the sample (55%) reported an education below of 12th grade. Maximum numbers of participants (76.8%) were married. in present study 33.5% were unemployed or employed part-time

(22.3%) and 22.3% were employed full time. Sociodemographic characteristics of study participants are shown in table 1. Among the study subjects common cause of limb loss was trauma (66.1%) followed by vascular causes of amputation. The most common level of amputation was transtibial (58.1%) followed by transfemoral (21.3%). Mean time since amputation was 4.96 years. Majority of amputees (71%) in the sample reported wearing prosthesis. Amputation characters of participants are listed in table 1.

Nonpainful phantom limb sensations

Three-fourth of the sample (n= 231, 74.5%) reported that they experienced nonpainful phantom limb sensations. Most (73.2%) of those reporting nonpainful phantom limb sensation described their sensation as intermittent (ie, come and go sensation). For most of those with nonpainful phantom sensations, the duration of their typical episode was brief- a few minutes (25.1%) or several minutes to an hour (58.9%). Nonpainful phantom limb sensations were significantly relation with phantom limb pain ("P" value <0.05) (Chi-square = 112.03 with 1 degree of freedom; P < 0.001).

Phantom Limb Pain

In this study, the prevalence of phantom pain during the preceding 4 weeks was 57.7%. The prevalence of phantom pain by demographic characteristics is presented in table 3. No statistically significant relation between phantom limb pain and age group of study participants were noted ("P" value >0.05) (Chi-square = 6.597 with 6 degrees of freedom; P = 0.360). Phantom pain relation with gender was non-significant ("P" value >0.05) (Chi-square=0.006 with 1 degree of freedom; P = 0.936). PLP relation with employment status was significant ("P" value <0.05) (Chi-square = 12.160 with 5 degrees of freedom; P = 0.034). Etiology of amputation was not found significantly with PLP ("P" value >0.05) (Chi-square = 11.138 with 6 degrees of freedom; P = 0.084). No statistically significant correlation exists between phantom limb pain and level of amputation ("P" value >0.05) (Chi-square = 8.337 with 6 degrees of freedom; P = 0.214). Time since amputation was found significantly associated with phantom limb pain ("P" value <0.05) (Chi-square = 99.269 with 4 degrees of freedom; P < 0.001). PLP was significant relation with prosthetic use (Chi-square = 35.532 with 1 degree of freedom; P < 0.001).

Most of the participants described phantom pain episode was for few minutes (25.1%) to 1 hour (58.9%) duration. Half (50.3%) of amputees reported phantom limb pain that could be characterized as mild in intensity (1-4), rated their pain in Numeric Rating Scale and 40.8 % rated moderate in intensity (5-6) (table 4). Participants were also asked to describe the quality of their phantom limb pain. Of the 179 participants who listed verbal descriptors of their phantom limb pain, the most commonly endorsed words were tingling (29.1%), sharp pricking (19%), shooting (13.4%), burning (12.8%), Squeezing (11.2%).

Residual limb pain

The prevalence of residual pain by demographic characteristics is shown in table 3. No statistically significant association found between age and residual limb pain ("P" value >0.05) (Chi-square = 9.033 with 6 degrees of freedom; P = 0.172). Gender and residual limb pain relation was not significant ("P" value >0.05) (Chi-square = 0.000 with 1 degree of freedom; P = 0.996). RLP relation with employment status was significant (("P" value <0.05) (Chi-square = 13.480 with 5 degrees of freedom; P = 0.020). Amputation etiology and RLP was non-significant ("P" value >0.05) (Chi-square = 2.958 with 6 degrees of freedom; P = 0.814). RLP and level of amputation was no significant (("P" value >0.05)

(Chi-square = 9.935 with 6 degrees of freedom; P = 0.127). Time since amputation was significant relation with RLP ("P" value <0.05) (Chi-square = 55.046 with 4 degrees of freedom; P < 0.001).

RLP was significant relation with prosthetic use (Chi-square = 10.674 with 1 degree of freedom = 0.001). Fifty-two percent (n= 160) of the participants reported that they experiences residual limb pain. Most (52%) described it as intermittent and rests of the participants not have residual limb pain. Most of the participants described duration of residual limb pain episode was for few minutes (24.4%) to 1 hour (41.9%) duration. Very few participants reported pain duration for a day or longer (table 4). Most of the participants intensity of residual limb pain was mild (51.9%) or moderate (41.3%). Of the 106 participants who listed words to describe the quality of their residual limb pain, the following descriptors were the most commonly reported: aching (27.5%), burning (25.6%), tingling (19.4%), sharp (13.1%), throbbing (12.5%).

A significant association between RLP and PLP was found in this study. 73.1% of participants who experienced phantom limb pain also experienced residual limb pain (Chi-square = 30.779 with 1 degree of freedom; P < 0.001).

Other pain sites

Among the 310 lower limb amputees a large number of participants (N=163, 52.6%) reported pain in the other anatomical side apart from phantom limb pain and residual limb pain. Back pain was reported by 60.7% of respondents. Other pain sites, other than back pain, were hip pain (9.8%), contralateral limb pain (5.5%). Back pain was most commonly intermittent in nature (98.2%). Durations of back pain episode were several minutes to hour in 41.1% cases, 44.2% reported their pain for more than one hour and 13.5% amputees for a day or longer. More than half (58.3%) participants quantified their back pain of moderate intensity in NRS rating (table 3,4).

To better understand the overall experience of pain after lower limb amputation, PLP, RLP, and back pain. These analyses revealed that over a third of the sample (38%) reported pain in all three locations, and 33% experienced pain in 2 of the 3 location, and 23% pain in only one location. Nine percent of the participants were pain-free.

Depressed mood

In this study sample, depressed mood (CES-D ≥16) was present in 25.2% participants. Prevalence of depressed mood is high (37.4%) among the lower limb amputees who reported phantom pain. Depressed mood (CES-D ≥16) was found significantly associated with phantom pain ("P" value <0.05) (Chi-square = 32.336 with 1 degree of freedom P < 0.001). Relation of prevalence of depressed mood with residual limb pain was significantly high. ("P" value <0.05)(Chi-square = 9.094 with 1 degree of freedom; P = 0.003). Prevalence of depressed mood was not significantly associated with other anatomical site pain ("P" value >0.05)(Chi-square = 0.835 with 1 degree of freedom; P = 0.361).

Our results indicate that persons with lower limb amputations experience a variety of nonpainful and painful phantom limb sensations. In our sample, 74% reported non-painful phantom sensations and 58% reported phantom limb pain. The study of Smith et al[17] and Esfandiari E et al[18] were found 63% prevalence of phantom limb pain among lower limb amputees. Most described their sensation as Intermittent (sensation that "come and go"). The duration of typical phantom sensation was brief – a few minutes (25.1%) or several minutes to hour (58.9%). Very less (2.1%) participants reported non-painful phantom sensations for a day or longer.

Participants reported a mean intensity rating of 4.65

(SD=1.33) on a scale 0 (no pain) to 10 (worst pain). These findings are nearly similar to the study of Ehde et al[19] and Sherman et al[6]. To describe the quality of PLP, most commonly endorsed verbal descriptors were tingling (29%), sharp pricking 19%), shooting (13.4%), burning (12.8%), Squeezing (11.2%) and pins and needles (5.6%). A study[19] also find similar pain Descriptors in his study. Maximum prevalence of PLP was found in our study in age group 61 to 70 years, which is similar to the study of Gallaher P et al [20] who found high pain level in old age. However, in our study, on statistical analysis older age was not found significant risk factor for phantom pain (P>0.05). Our study and other study results found no significant sex difference in the occurrence or intensity of phantom limb pain.[12,21,22] In our study, unemployment was positively associated with prevalence of phantom limb pain (P<0.05). Millstein et al[23] surveyed a large population of persons with amputation and concluded that phantom limb and residual limb pain was negatively related to successful employment.

Our study was not found significant association between prevalence of phantom limb pain and level of amputation (P>0.05). There are conflicting data regarding relationships between level of amputation and presence of PLP. Some studies emphasize that there was no association found between PLP and amputation Level.[8, 22, 24, 25] In our study, prevalence of phantom limb pain was higher among diabetic (86.7%) and Vascular (75.9%) causes of amputation. Our finding is well supported by Weiss et al, [2] and Noguchi et al [26], who found strong association between diabetic, vascular cause of amputation and PLP. However, in our study, etiology was not found significant risk factor for PLP (P>0.05). In our study prevalence of PLP has been shown to decrease with time since amputation, with highest (90.2%) in 6 months to 1year after amputation and only 8.8% participants' reported phantom limb pain after 10 years of amputation. These findings are supported by Jensen et al[5] who found non-painful and painful phantom sensations were decrease with time. In our study, prevalence of phantom limb pain was higher (84.4%) in lower limb amputees who were not using any prosthesis as compared to prosthesis users (46.8%). Weiss et al[2] also found significant decrease in phantom limb pain in prosthesis group. They suggested that the increase use of the amputation stump by wearing prosthesis produced a countervailing use dependent, afferent increase of cortical reorganization that reverse the phantom limb pain.

In amputees, residual limb pain is as common as phantom limb pain. In our study 51.7% participants reported experiencing residual limb pain in the previous 4 weeks. Our data suggest that residual limb pain is less common as phantom sensations and phantom limb pain, but was rated the worst pain by more participants than any other pain side. The prevalence of residual limb pain in our sample was notably lower than the prevalence reported in previous studies.[17,19,27] Our study did not find significant association between prevalence of residual limb pain with age, sex etiology and level of amputation. Prevalence of residual limb pain also tends to decrease with time since amputation with highest (80.4%) in 6 months to one year after amputation. These findings are supported by study[5] who found PLP and RLP were decrease with time. In present study, significant correlation was found between prevalence of residual limb pain and Unemployment. A study[15] found Unemployed amputees reporting higher level of pain and lower level of prosthesis use.

Similar to previous studies[20,25,26] a significant association between residual limb pain and phantom limb pain was

found in this study. One fourth of the respondents (26.9%) not reporting PLP reported RLP, whereas 73.1% of those who experienced PLP also experienced RLP. Kooijman suggest the co-occurrence of RLP and PLP may result from an inability to distinguish between these pain types. On the other hand, RLP may trigger PLP, making it extremely difficult to separate these phenomena.

Since we were interested in knowing if persons with lower limb amputation have pain in sites other than their amputated limb, we asked participants to indicate whether they had pain in other pain locations (back pain, contralateral limb pain, knee pain, hip pain, and shoulder, arm and neck pain). Our results indicate that chronic pain following amputation is not necessarily limited to the amputated limb. More than half of our sample (52.58%) reported pain in sites other than their amputated limb. Most of them described their pain as Intermittent 2 to 6 times a week. For most (58.3%) pain was of moderate intensity.

In our study, nearly a quarter of amputees were found to have depressive symptom (CES-D >16). Amputees with phantom limb pain were more likely to have depressive symptoms (37.4%) than those not experienced phantom limb pain (8.4%). In a study[25] found depression was a common predictor of increased level of pain intensity and bothersomeness of post amputation pain. These results support to the need to assess the mood of persons reporting amputation related pain and aggressively treat depression as part of the pain control program.

Conclusion

There are few studies reported in India, so this study is an important step to report the prevalence and risk factors for Phantom limb pain and residual limb pain following lower limb amputation in Indian scenario. Non-painful phantom limb sensation, phantom limb pain and residual limb pain are common after lower limb amputation. For the majority of participants pain associated with an amputation is episodic and of mild to moderate intensity, however, for some, phantom limb pain and residual limb pain may be highly disabling and bothersome.

Age, gender, etiology, and level of amputation were not found significant risk factor for PLP and RLP. Unemployment and depressed mood were positively associated with PLP and RLP. Pain was less common in prosthesis users. A significant number of participants reported pain other than amputation sites specifically back pain.

Improved understanding of the prevalence of various post amputation pain and its characteristics may help to improve the care and Rehabilitation of amputees. This study forms a basis for further research on predictors of the development of PLP, RLP and other anatomical site pain; measures to prevent and treat these pain and prospective long term follow up of amputees.

Abbreviations

N: Number

% : Percentage

PLP: Phantom limb pain

RLP: Residual limb pain

SD: Standard deviation

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