Post-Amputation Pain Presentations: Considering Biological Sex

Samantha J. Stauffer, CPO, MSOP; Independence Prosthetics-Orthotics; sstauffer@independencepo.com
J. Megan Sions, PT, DPT, PhD; University of Delaware; megsions@udel.edu

Creation Date: April 2024; Date for Reassessment: April 2029

Evidence Table

	Hirsh, 2010[4]	*Bosmans, 2014*[5]	*Beisheim, 2020*[6]	*Mioton, 2020*[7]	*Beisheim-Ryan, 2021*[8]	*Liston, 2022*[9]
Population	N=335 adults with LL (72% male; 92% Caucasian; 58.9±14.1 years; 77.9% traumatic cause; 99% lower-limb)	N=85 adults with LL (61.2% male; 58.2±17.4 years; 59% dysvascular cause, 86% lower-limb)	N=303 adults ≥ 1 year post unilateral lower LL (67% male; median age 56 [46, 56]* years; 73.3% transtibial; 36.3% traumatic cause)	N=727 individuals with lower- and upper- LL (66.4% male; 85% Caucasian; 92.4% lower-limb; 42% traumatic cause)	N=94 adults with unilateral transtibial LL (62.4% male; median age 49 [38, 57]* years; 42.6% traumatic cause)	N=29,507 adults who underwent lower LL from 2007-2017 (65.7% male; 84.3% aged ≥50 years)
Study Design	Cross-sectional survey study	Observational, longitudinal survey study	Cross-sectional survey study	Cross-sectional survey study	Cross-sectional study	Retrospective study
Methodology	Participants were recruited through a database of people who had consented to be recontacted for research, an amputation list serve, and the community.	Individuals completed the questionnaires at amputation, then 4 subsequent times between initial amputation & 3.5 years after amputation.	Participants completed a standardized interview about presence of amputation-region (e.g., PLP, RLP) and remote-site pain.	Participants were recruited from conferences, prosthetic clinics, amputee support groups, and via brochures to complete surveys.	Pain-pressure thresholds were tested using pressure algometry at 10 sites distributed across the amputated limb, sound limb, and upper limbs.	Data was pulled from a national insurance-based claims database to evaluate associations between pain reporting and demographic and comorbid risk factors.
Outcomes	PLP and RLP presence and severity (per the NPRS)	Groningen Questionnaire Problems after (Leg/Arm) Amputation	Prevalence of pain by site, number of sites, and distribution.	Patient-Reported Outcome Measurement System and NPRS for RLP and PLP	PLP and RLP presence and severity (per the NPRS), pain-pressure thresholds	Incidence of postoperative neuroma, neuralgia, and PLP
Key Findings	Male sex was associated with higher prevalence of PLP ($p<0.05$); this did not hold after controlling for amputation cause. There were no significant differences in RLP prevalence or in PLP or RLP severity, but females reported greater ($p<0.05$) overall pain intensity.	Female sex (OR: 8.06; 95% CI: 2.05-31.25), upper limb loss (OR: 7.04; 95% CI: 1.14-43.48), and shorter time since amputation (OR: 1.90; 95% CI: 1.24-2.92) were associated with greater risk of PLP.	Female sex was associated with higher prevalence of RLP, low back pain, and contralateral hip and knee pain. Females had higher odds (OR: 2.40; 95% CI: 1.40-4.12) of reporting multisite pain.	Female sex was associated with increased risk of PLP (OR: 1.63; 95% CI: 1.22-2.18) and RLP (OR: 1.37; 95% CI: 1.03-1.83). Females, on average, reported higher pain intensity than males.	84.7% of individuals with pain reported PLP; 44.1% had co-occurring PLP and RLP. Females had significantly lower pain-pressure threshold than males at all tested sites.	Overall prevalence of nerve-related pain in the first year was 14.3% (phantom limb pain: 10.9%; neuralgia: 4.4%; neuromas: 0.4%). Male sex was stated to be associated with increased incidence of nerve-related pain and/or PLP 1-year after amputation (OR: 0.86; 95% CI: 0.81-0.91).
Study Limitations	This study's generalizability is limited by low response rate (56.2%), low racial diversity, and a relatively low proportion of female participants.	This study's generalizability was limited by low retention of participants at follow-up (62%) and lack of consideration of existing pharmacological intervention.	Secondary analysis of existing data precludes *a priori* power analysis. Data reported was a mix of verbal and written surveys, which may affect reliability of pain reporting.	Mixed-methods data collection (some onsite with study coordinator, some from home) may affect how pain was reported. Sample was predominantly white and male, limiting generalizability.	Adults with lower-limb loss had low pain intensity (i.e., median worst pain in past 24 hours was 4/10 for RLP and PLP), limiting generalizability to individuals with more severe pain. Exclusion criteria (e.g., no wounds) may underestimate point prevalence of pain.	Incidence of neuropathic pain may be under-estimated given use of ICD-10 codes from insurance claims. Pain-related codes may not have been added on claims if code(s) were not deemed relevant to provided services (e.g., surgical care, prosthetic care). Interpretation of results dubious given statement of increased risk with male sex but report of odds ratio <1.

Abbreviations: LL= limb loss; PLP=phantom limb pain; RLP=residual limb pain; NPRS=Numeric Pain Rating Scale; OR=odds ratio; CI=confidence interval; ICD=International Classification of Diseases

* Data reported as median (25th percentile, 75th percentile) rather than mean ± standard deviation