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Frequency of Low Back Pain and its Effect on Function and Health-Related Quality of Life across Three Levels of Lower Limb Amputation: A Cross-Sectional Study

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Author`s Contribution

[1-3,5]Conception and design, [1-3]Collection and assembly of data, [4,6]Analysis and interpretation of the data, Statistical expertise, drafting of article, [4]Critical revision of the article for important intellectual content, Final approval and guarantor of the article.

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A B S T R A C T

Background: Amputation is a profoundly life-altering event that can have both physical and psychological impacts on individuals.

Objective: This study aimed to investigate the frequency of low back pain and its effect on function and health-related quality of life in individuals with various levels of lower limb amputation.

Methods: It was a cross-sectional study at the Pakistan Institute of Prosthetic and Orthotics Peshawar (PIPOS) from May to September 2020, 264 participants were purposively selected. Inclusion criteria: males and females aged 18-65 with unilateral transfemoral, knee disarticulation, or transtibial amputations. Exclusion criteria: hearing/speech impairments, hip pathology, or bilateral lower limb amputation. Data collected via self-administered questionnaires, including the Roland Morris Disability Questionnaire (RMDQ) and the Short Form 36 Health Survey (SF-36). Data analyzed using SPSS v.25.

Results: Of the 264 participants, 219 were males (83%), and 45 were females (17%). There was significant connection between before and after amputation back pain ($P < 0.05$). However, no notable link was observed between low back pain and the three amputation levels ($P > 0.05$). Moreover, there was no statistical disparity in disability based on the level of amputation ($P > 0.05$). Significantly, low back pain differed across all quality of life domains ($P < 0.05$), except for mental and physical health. In contrast, no statistical variation was noted in the quality of life among the three amputation levels ($P > 0.05$).

Conclusion: This study underscores the prevalence of low back pain in lower limb amputees. However, we did not find a clear association between low back pain and specific amputation levels (unilateral transfemoral, knee disarticulation, or transtibial amputation). Additionally, low back pain appears to impact disability and select aspects of quality of life, such as physical function, social function, and general health in individuals with lower limb amputation.

Keywords: low Back pain, Lower limb Amputation, Quality of life.

Introduction

Amputation represents a significant and impactful event that can have both physical and psychological repercussions, greatly influencing one's overall quality of life.[1, 2] This disability brings about profound changes in an individual's life, with lower limb amputations being the most common and having a substantial impact on an amputee quality of life.[3] Amputations can be categorized as knee joint amputations, with knee disarticulation being the term for amputations at the knee joint, transfemoral for those above the knee, and transtibial for those below the knee.[3,4] Individuals with lower limb amputations (LLA) are more prone to experiencing low back pain (LBP) comparatively with general population. Although the main cause remains unclear, some biomechanical factors such as leg length discrepancy, prosthetic gait, and compensatory

movements of the back are believed to play a role.[5] It's worth noting that LBP is a prevalent health issue affecting 11-38% of the general population. However, it is even more common in people with lower limb amputations, including above-knee (AKA) and below-knee amputations (BKA).[6] This can lead to functional limitations and disability. Low back pain has a lifetime prevalence ranging from 60% to 90%, with an annual incidence of 5%.[7] After unilateral amputation there many factors develop which contribute to LBP, including asymmetrical movement, abnormal joint forces, differences in leg length between both limbs, also the type of prosthesis use and different MSK related atrophy and loss of strength. Collectively all these factors increase the unequal distribution of mechanical stress which resulting the in lumber region pain, which can affect the mental and physical health.[8] Risk is high for Diabetic patients due to vascular complications. Various demographic factors, diabetes duration, glycemic control and other neuro vascular and renal condition are the main predictors of lower limb amputation.[9, 10] Amputation related residual and phantom limb pain can also affect the overall functioning of amputee. [11]

While mobility is a crucial rehabilitation goal, other factors play a significant role in the well-being of amputees. The best outcome of rehabilitation program is on quality of life.[4] However, there is limited evidence available on the frequency of low back pain and its impact on disability and quality of life in lower limb amputee patients across different levels of amputation. At the national level, there is a lack of reported evidence on this topic, and on the international level, only a few studies have explored the quality of life in lower limb amputees and the frequency of back pain following amputation.

Methodology

This was a cross-sectional study conducted at the Pakistan Institute of Prosthetic and Orthotics in Peshawar (PIPOS), with approval from the Institutional Research Board of Northwest Institute of Health Sciences, Peshawar (Ref No: 03/11/20/NWIHS-COPT/IBR/2021). The study involved a total of 264 amputee patients selected through purposive sampling. The sample size was determined using the Open Epi calculator, considering a population size (N) of 840 with a 95% confidence level. Inclusion criteria comprised both males and females aged 18-65 years, patients with unilateral transfemoral, knee disarticulation, and transtibial amputation. Exclusion criteria encompassed participants with hearing or speech impairment, hip pathology, mental incapacity, sacroiliac joint pathology, upper limb amputation, and bilateral limb amputation. Informed consent was obtained from all patients, and they were briefed about the study's objectives. Data collection was carried out using self-administered questionnaires, with outcomes assessed through the Roland Morris Disability Questionnaire (RMDQ), the Short Form 36 Health Survey (SF-36), and questions pertaining to the prevalence of low back pain (LBP).

The (RMDQ) questionnaire intended to evaluate how back pain impacts functional activities. Each question is assigned one point, resulting in scores from 0 (no disability) to 24 (severe disability). Studies have shown a high reliability of the RMDQ with a correlation of 0.09.[12]

The Short Form-36 Health Survey (SF-36) is a versatile health survey comprising 36 questions. It yields an eight-scale profile of scores, effectively summarizing physical and mental measures. The SF-36 is valuable for comparing general and specific populations, estimating the relative burden of different diseases, and evaluating the benefits of treatment. The eight scales, replicating the Physical Component Summary (PCS) and Mental Component Summary (MCS), cover physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health. Scores range from 0 to 100, the higher score the less will be disability and vice versa. The SF-36 has been widely adopted and is used across different languages and disease states, with a scoring range of 0-100, where 100 represents the best possible score. [13] Two questions related to the frequency of LBP were adapted from a parent study, each utilizing a Likert scale with five categories.[3]

For data analysis 25th version of SPSS was used. Definite variables such as back pain before and after amputation and the level of amputation were presented as frequencies and percentages. A Chi-square test was employed to identify associations between categorical variables. As the data did not follow a normal distribution, a non-parametric test, the Kruskal-Wallis test, was utilized to detect statistical differences between variables.

Results

A total number of 264 amputee's patients with the frequency of male 219 (83**%**) and female 45 (17**%**) with a mean age of (40.38) was taken from PIPOS center Peshawar. Among these, Trans tibial amputee were much higher 142 (53.8**%**) as compared to Trans femoral and knee disarticulation. The major cause of amputation was trauma 171(64.8%) table I.

No pain was reported on daily basis before amputation while 32 (12.1%) reported low back pain on daily basis after amputation. Before amputation, no participants reported low back pain several times a week while after amputation, 24 (9.1%) participants reported low back pain several times a week (table I). There were significant

associations of low back pain between pre and post amputation with (P< 0.05) table II.

Table I: Frequencies and Percentages of Demographics

Variables	Frequency (%)
Gender	
Male	219 (83%)
Female	45 (17%)
Marital status	
Married	200 (75.8%)
Unmarried	64 (24.2%)
Level of amputation	
Transtibial	142 (53.8%)
Transfemoral	90 (34.1%)
Knee disarticulation	32 (12.1%)
Amputation Causes	
Trauma	171 (64.8%)
Diabetic	62 (23.5%)
Others	31 (11.7%)
Walking adds	
Yes	223 (84.5%)
No	41 (15.5%)
Extent of prosthesis uses	
1-6 month	35 (13.3%)
6 months -1 year	70 (26.5%)
1 to 3 years	81 (30.7%)
4 years to onwards	78 (29.5%)
Low Back pain Before the amputation	
No	154 (58.3%)
infrequently	80 (30.3%)
rare in month	30 (11.4%)
numerous in week	0
everyday	0
Low Back pain After the amputation	
No	120 (45.5%)
infrequently	53 (20.1%)
rare in month	35 (13.3%)
numerous in week	24 (9.1%)
everyday	32 (12.1%)
Total	264

There was no statistical difference between disability and level of amputation (P> 0.05) (table IV).

Table III: Association of LBP across the level of amputation

		Level of amputation			Total	[a]P-value
		Trans Tibial	Trans Femoral	Knee disarticulation		
Low Back Pain	No	63	45	12	120	.721
	infrequently	32	16	5	53	
	Rare in month	19	12	4	35	
	numerous in week	13	7	4	24	
	everyday	15	10	7	32	
Total		142	90	32	264	

To find the significance between LBP and disability, the mean rank of Participants disability having LBP on daily basis was (240.72) and LBP on several time a week was (216.56). There was statistical difference between disability and low back pain with (p<0.05).

Our data was not normally distributed, non-parametric i, e. Kruskal Wallis test were useful to find the implication between amputee and its levels. No significant found between amputee level and quality of life (P> 0.05) (table IV).

To find the significance between LBP and quality of life, there was a statistical difference between Post amputation low back pain and some domains of QOL, i.e. social functioning, and emotional wellbeing (P<0.05) while physical health and mental health was found non-significant (P> 0.05) (table V).

Table II: Association of LBP before and after amputation.

		Low Back pain post-amputation						
		No	infrequently	rare in month	numerous in week	everyday	Total	[a]P-value
Low Back pain pre-amputation.	No	120	28	2	4	0	154	0.00
	infrequently	0	25	32	16	7	80	
	rare in month	0	0	1	4	25	30	
	numerous in week	0	0	0	0	0	0	
	everyday	0	0	0	0	0	0	
Total		120	53	35	24	32	264	

[a]Chi-square test

There was no significant association found between LBP and across the three levels of amputation with (P> 0.05) table III.

The data of RMDQ was not normally distributed, so non-parametric i.e. Kruskal Wallis test were applied to find the significance between the Disability and level of amputation.

Discussion

Based on our current study, back pain is prevalent post-amputation. There was significance between low back pain before and after amputation.[13] A study by Friberg et al. similarly supported this finding, attributing the higher post-amputation back pain.[14]

Table IV: SF36, RMDQ and level of amputation (Kruskal-Wallis test)

Variables		Level of amputation	Mean Rank	Median (IQR)	P-value
SF36	Physical function	Transtibial	126.64	55.0 (40.0)	.392
		Transfemoral	138.31		
		Knee disarticulation	142.14		
	Mental health	Transtibial	133.25	.0 (33.3)	.914
		Transfemoral	132.76		
		Knee disarticulation	128.44		
	Emotional role	Transtibial	135.46	68.0 (40.0)	.510
		Transfemoral	132.91		
		Knee disarticulation	118.19		
	Social role	Transtibial	123.80	75.0(37.5)	.077
		Transfemoral	138.59		
		Knee disarticulation	154.00		
RMDQ		Transtibial	130.02	13.00	.123
		Transfemoral	127.47		
		Knee disarticulation	157.64		

Table V: Low Back pain, SF36 and RMDQ (Kruskal-Wallis test)

Variables		Low back pain	Mean rank	Median(IQR)	P-value
SF36	Physical function	No	147.39	55.0 (40.0)	.006
		infrequently	137.72		
		rare in month	98.04		
		numerous in week	114.06		
		everyday	119.55		
	Mental health	No	142.56	.0 (33.3)	.125
		infrequently	128.30		
		rare in month	125.80		
		numerous in week	118.29		
		everyday	119.72		
	Emotional	No	158.44	68.0 (40.0)	.000
		infrequently	151.96		
		rare in month	96.57		
		numerous in week	85.33		
		everyday	77.67		
	Social	No	156.48	75.0 (37.5)	.000
		infrequently	132.32		
		rare in month	119.46		
		numerous in week	92.29		
		everyday	87.28		
RMDQ		No infrequently rare in month numerous in week everyday	Yes, everyday	13.00	.000

Current study did not observe any difference in perception of LBP across different levels of amputation. There was no significant association of low back pain across the three levels of amputation ($p > 0.05$). However, a study by J. Kulkarni et al. determined that chronic LBP was comparably high in Trans femoral amputee than trans tibial ($p < 0.05$). An incidental finding in their study was psoas muscle hypertrophy on in intact limb in Trans femoral amputee. [15]

Current study did not find any significant between disability and the level of amputation ($p > 0.05$). other studies find significant between higher level amputation and disability ($p < 0.001$).[16]

In our current study, we identified a statistical difference between low back pain and disability; the more back pain was reported, the greater the disability observed. This finding aligns with a study by Karen et al., which indicated a significant difference between low back pain and disability ($p < 0.000$).[17]

Our study also revealed that the quality of life was lower among participants across various domains of the SF-36. We observed a statistically significant association between post-amputation back pain and several domains of SF-36,

including general social functioning, physical functioning, and emotional well-being ($p < 0.05$). This aligns with existing literature, which shows a significant association between back pain and lower scores in social ,mental health and physical component scale and the mental component scale.[18]

Another study by war related amputation and their quality of life was higher sf36 score in emotional subscale due to emotional problems and role limitation due to physical problems, while other subscales, particularly physical functioning .[19]

Current study does not find association between the amputation levels and quality of life. While other study finds the low quality of life among amputation below the knee joint, in which there physical health is affected ($p < 0.05$). [20]

Limitations of the Study: One notable limitation is that the assessment of back pain before the amputation relied on retrospective data collected from several years ago. This introduces the possibility of unreliable or inaccurate information due to the passage of time and memory biases. To obtain a more precise assessment of low back pain among amputees, further research is warranted. Future studies should aim to collect more recent and prospective data to enhance the accuracy and reliability of the findings.

Conclusion

This study found that LBP was prevalent in patients having lower limb amputation while no association exist between low back pain and across the three level of amputation (Unilateral Trans femoral, knee disarticulation, and Trans tibial amputation). Furthermore, low back pain may affects the disability and some aspects of physical and social function, and general health in patients having lower limb amputation.

This study holds significance for healthcare professionals as it provides valuable insights into the relationship between low back pain, quality of life, and disability in individuals with lower limb amputations. Clinicians can use the findings to better understand the challenges and issues faced by amputees and tailor their treatment and management strategies accordingly. By recognizing the prevalence of low back pain and its impact on quality of life and disability, clinicians can focus on addressing these complications and improving the overall well-being of their patients with amputations.

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