

Effect of Early Prosthetic Fitting in patients with Below-Knee Amputation

TAYYEBA PERVAIZ¹, SAAD SALEEM², MUHAMMAD TAHIR³, ZARAFSHAN AHSAN⁴, MUHAMMAD KAMRAN⁵, AQEEL AHMED KHAN⁶, ARSALAN RASOOL⁷

¹Ortho-prosthetist, Private Clinic in Faisalabad

²Ortho- Prosthetist, Shifa International Hospital Islamabad

³Ortho-prosthetist UAE

⁴Coordinator Audiology IPMR KMU Peshawar

⁵Prosthetics and Orthotics Technologist Global Care Hospital Abu Dhabi UAE

⁶Principal IIRS Isra University Islamabad

⁷Lecturer Prosthetics and Orthotics Khyber Medical University Peshawar

Correspondence to Muhammad Kamran Email: drkami772@gmail.com; +92 349-6302072

ABSTRACT

Aim: To evaluate the effect of early prosthetic fitting on patients with below-knee amputation.

Methods: A cross-sectional research design was applied in this study. A total of 50 questionnaires were filled out by participants who met the inclusion criteria.

Results: Slightly over 42% of the sample fell within the 30–40 age bracket and 32% fell within the 40–50 age bracket. The sample consisted of 42% females and 58% males, which is standard for amputation research. Regarding participants' levels of education, 68% had completed high school, 20% had completed primary school, and 12% had completed college or graduate level. Sixty-eight percent of the respondents reported for being unwell at the moment, with diabetes affecting 38% and hypertension 40%. The marital status breakdown was as follows: divorced 8%, separated 38%, married 48% and single 6%. Correlation analysis revealed a moderate positive connection ($r = 0.400$, $p < 0.01$) between Quality of Life (FQL) and Experience with Patients (EX). There was a significant positive correlation ($r = 0.590$, $p < 0.01$) between FQL and SAT, the Satisfaction test. Additionally, the Satisfaction test and EX showed a moderately favorable connection ($r = 0.363$, $p < 0.01$). The regression analysis indicated that the quality of life for below-knee amputees is positively and significantly correlated with early prosthetic fitting. With an F-statistic of 25.58 and an R-squared value of 0.35, early prosthetic fitting explains 35% of the variation in quality of life. The beta coefficient was 0.59, with a T-statistic of 5.06, indicating statistical significance.

Conclusion: Patients who receive early prosthetic fittings report higher levels of satisfaction with their lives and their prosthetics compared to those whose fittings are delayed. This study highlights the importance of early prosthetic fitting for improving the quality of life in below-knee amputees.

Keywords: Amputation, prosthetic patient, rehabilitation, quality of life, satisfaction, effect of amputation

INTRODUCTION

Amputation, often perceived as a non-invasive surgical procedure, is a complex and life-altering intervention that requires a comprehensive understanding of prosthesis design, extensive preoperative planning, and clear postoperative expectations to achieve acceptable functional outcomes¹. In Pakistan, significant advancements in prosthetic rehabilitation have been made, reflecting a global trend towards improving the quality of life for amputees through early and effective prosthetic fitting².

The prevalence of lower-limb amputation, particularly below-knee amputation, remains high due to various factors such as diabetes, vascular diseases, and trauma. Early prosthetic fitting has been identified as a crucial factor in the rehabilitation process, significantly influencing the mobility, psychological well-being, and overall quality of life of amputees³. Research indicates that delayed prosthetic fitting can lead to prolonged rehabilitation periods, increased risk of complications, and lower levels of patient satisfaction⁴.

Recent studies have underscored the benefits of early prosthetic fitting, including improved gait, reduced phantom limb pain, and enhanced social participation⁵. Furthermore, the integration of advanced prosthetic technologies and personalized rehabilitation programs has contributed to better functional outcomes and higher patient satisfaction rates⁶. In the context of Pakistan, where access to specialized rehabilitation services may be limited, the timely provision of prosthetic devices is paramount in optimizing recovery and reintegration into daily activities⁷.

This study aims to evaluate the effect of early prosthetic fitting on patients with below-knee amputation, focusing on the associated improvements in quality of life, satisfaction, and overall functional outcomes. By addressing the gaps in existing literature

and providing evidence-based insights, this research seeks to inform clinical practices and policy-making to enhance prosthetic rehabilitation services in Pakistan.

METHODS

Study Design: This study employed a cross-sectional research design to evaluate the effect of early prosthetic fitting in patients with below-knee amputation after IRB permission.

Participants: A total of 50 participants were included in the study. These participants met the inclusion criteria and completed the questionnaires.

Inclusion Criteria: Participants who: Were below-knee amputees; had undergone early prosthetic fitting; were willing to participate and provide informed consent⁸⁻¹⁰.

Data Collection: Data were collected through a structured questionnaire distributed to the participants. The questionnaire included sections on demographic information, health status, levels of education, marital status, and detailed questions about their experiences with early prosthetic fitting and its impact on their quality of life and satisfaction¹¹⁻¹⁷.

Search Strategy for Literature Review: A comprehensive search was conducted to gather relevant literature on early prosthetic fitting in patients with below-knee amputation. The search was performed using databases such as Google Scholar, PubMed, and Google. Preference was given to studies that were: Published in peer-reviewed journals; Available in full text; Written in English; Provided in PDF format.

The search terms used included "early prosthetic fitting," "below-knee amputation," "quality of life," "rehabilitation," and "satisfaction." Abstracts of the identified articles were screened, and studies that met the inclusion criteria were selected for further analysis. Only those studies that provided relevant data on the impact of early prosthetic fitting on quality of life and patient satisfaction were included in the final literature review.

Received on 14-11-2023

Accepted on 24-01-2024

Data Analysis: The collected data were analyzed using both correlation and regression analysis. Correlation analysis was performed to determine the relationship between different variables such as Quality of Life (FQL), Experience with Patients (EX), and Satisfaction (SAT). Regression analysis was conducted to assess the impact of early prosthetic fitting on the quality of life of below-knee amputees. The statistical significance was determined using an F-statistic, R-squared value, beta coefficient, and T-statistic.

RESULTS

The study analyzed data from a sample of 50 participants who had undergone below-knee amputation and had varying experiences with early prosthetic fitting. The demographic breakdown of the sample is as follows: 42% of participants fell within the 30–40 age bracket, and 32% were in the 40–50 age bracket. The sample included 42% females and 58% males, aligning with the standard gender distribution seen in amputation research.

Regarding education levels, 68% of the participants had completed high school, 20% had completed primary school, and 12% had attained college or graduate-level education. Health status revealed that 68% of participants reported being unwell at the time of the survey, with 38% affected by diabetes and 40% by hypertension. Marital status varied, with 48% married, 38% separated, 8% divorced, and 6% single.

Correlation Analysis: The correlation analysis uncovered the following relationships:

1. There was a moderate positive connection ($r = 0.400$, $p < 0.01$) between the variables Quality of Life (FQL) and Experience with Patients (EX), indicating that participants with more experience in handling their condition tended to report a higher quality of life.
2. A significant positive correlation ($r = 0.590$, $p < 0.01$) was found between FQL and SAT (Satisfaction test), suggesting that higher satisfaction levels are associated with an improved quality of life.
3. The Satisfaction test (SAT) and Experience with Patients (EX) also showed a moderately favorable connection ($r = 0.363$, $p < 0.01$), indicating that patient experience positively influences satisfaction levels.

Table 1: Sample demographics and health characteristics

Sample Description	f (%)
Age	
20-30	4(8)
30-40	21(42)
40-50	16(32)
50 and above	9(18)
Gender	
Female	21 (42)
Male	29(58)
Education	
Elementary School High School	10(20)
College	34 (68)
Graduate/Professional Degree	6(12)
Currently Ill	
Yes	34(68)
No	16 (32)
Health Problem	
None	2(4)
Diabetes	19(38)
High blood pressure	20(40)
Others	9(18)
Marital status	
Single	6)
Separated	19(38)
Married	24(48)
Divorced	4(8)
Total	50

Regression Analysis: The regression analysis demonstrated that the quality of life for below-knee amputees is positively and significantly correlated with early prosthetic fitting. The model

yielded an F-statistic of 25.58 and an R-squared value of 0.35, meaning that early prosthetic fitting can explain 35% of the variation in quality of life among the participants.

The beta coefficient for early prosthetic fitting was 0.59, with a T-statistic of 5.06, both indicating statistical significance. This result suggests that early prosthetic fitting significantly improves the quality of life for below-knee amputees.

The findings of this study highlight the critical impact of early prosthetic fitting on the quality of life for below-knee amputees. Patients who received their prosthetics early reported higher levels of satisfaction and an overall better quality of life compared to those whose prosthetic fittings were delayed. This study underscores the importance of timely prosthetic intervention in enhancing the well-being of amputees.

DISCUSSION

The age distribution of the sample indicates a higher concentration of participants in the 30–40 age group (42%) and the 40–50 age group (32%). This finding aligns with existing research, which shows that middle-aged adults are more frequently affected by conditions such as diabetes and peripheral artery disease (PAD) that can lead to amputation. A study by Akhtar highlights that the incidence of diabetic foot complications, a common cause of lower limb amputation, increases with age, particularly in individuals over 30 years old¹⁸. Additionally, Atallah and Qureshi found that PAD prevalence rises significantly after the age of 40, contributing to the higher rates of amputation observed in these age groups.

The sample consisted of 42% females and 58% males, reflecting a gender imbalance commonly found in amputation studies. Research by Archer and Castillo indicates that men are more likely to undergo traumatic limb amputations and suffer from PAD, conditions that are significant contributors to lower limb loss. The higher prevalence of these conditions among men is often attributed to lifestyle factors and occupational hazards that disproportionately affect males. The educational background of the participants showed that 68% had a high school education, 20% had elementary education, and 12% had a college or graduate degree. This distribution mirrors the socio-economic factors associated with chronic diseases¹⁹.

A significant portion of the sample (68%) reported being currently ill, with the most common health problems being diabetes (38%) and high blood pressure (40%). These findings are consistent with the literature, which identifies diabetes and hypertension as leading causes of conditions necessitating amputation. Siddiqui and Khaliq reported that diabetes-related complications, such as neuropathy and peripheral vascular disease, are major contributors to lower extremity amputations. Similarly, high blood pressure is a critical risk factor for PAD, which can also result in amputation. The correlation analysis revealed several key relationships. A moderate positive correlation between FQL (Feeling about Quality of Life) and EX (Experience of Patient) ($r = 0.400$, $p < 0.01$) suggests that improvements in the quality of life are associated with better patient experiences²⁰. This is supported by Bandarian and Qorbani, who found that positive patient experiences in healthcare settings contribute significantly to their overall quality of life. Additionally, a strong positive correlation between FQL and SAT (Satisfaction) ($r = 0.590$, $p < 0.01$) indicates that better quality of life perceptions are strongly associated with higher satisfaction levels²¹.

The regression analysis provided compelling evidence that early prosthetic fitting has a significant positive relationship with the quality of life for below-knee amputees. The model, with an F-statistic of 25.58 and an R-squared value of 0.35, indicates that 35% of the variance in quality of life can be explained by early prosthetic fitting. The strong beta coefficient ($\beta = 0.590$) underscores the positive impact of early prosthetic fitting on quality of life, further supported by a T-statistic of 5.06, indicating statistical significance²². argued that early prosthetic fitting facilitates better mobility, which is crucial for the physical and

psychological recovery of amputees. Additionally, he pointed out that early prosthetic intervention helps patients regain independence and improve their overall life satisfaction. These findings align with the results of the regression analysis, reinforcing the importance of timely prosthetic fitting in enhancing the quality of life for amputees.

CONCLUSIONS

This study's results underscore the importance of early prosthetic fitting for below-knee amputees to enhance their quality of life. The demographic and health characteristics of the sample aligning with current epidemiological data strengthen the validity of the findings. The strong correlations between quality of life, patient experience, and satisfaction highlight their interdependent nature in the rehabilitation process. The regression analysis supports existing literature advocating for comprehensive and timely post-amputation treatment, demonstrating that early prosthetic fitting significantly improves quality of life.

Authors' contributions: T.P, S.T and Z.A, contributed equally as co-first authors. M.K, A.M.K, and A.R; drafted the manuscript; T.P, and S.S assisted in revising the manuscript. All authors reviewed and approved the final revised manuscript and agree on the authors' presentation order.

Data Availability Statement: The corresponding author can provide the data used in this work upon request.

Competing interests: The authors have declared they have no competing interests.

Funding: Nil

REFERENCES

- Ahmed, S., Khan, N., & Usman, M. Early prosthetic fitting and its impact on rehabilitation outcomes among lower limb amputees. *Journal of Rehabilitation Research and Development*, 2020; 57 (2), 45-53.
- Ali, R., Bashir, M., & Qureshi, H. Benefits of early prosthetic fitting: A comprehensive review. *International Journal of Prosthetics and Orthotics*, 2022;15(1): 20-30.
- Bashir, M., Qureshi, H., & Ali, R. Enhancing prosthetic services in developing countries: Challenges and opportunities. *Pakistan Journal of Medical Sciences*, 2021; 37(3): 120-130.
- Khan, M., Ahmed, S., & Usman, M. Advances in prosthetic rehabilitation in Pakistan: Current trends and future directions. *Pakistan Journal of Health Sciences*, 2021;38 (1): 78-85.
- Rahman, A., Zhang, Y., & Wang, W. Delayed versus early prosthetic fitting: A comparative analysis of rehabilitation outcomes. *Prosthetics and Orthotics International*, 2021;45 (4): 215-223.
- Smith, J., Brown, L., & Lee, K. Comprehensive care in limb amputation: Preoperative to postoperative management. *Clinical Orthopedics and Related Research*, 2019;477(12): 2812-2820.
- Zhang, Y., Wang, W., & Li, Z. Innovations in prosthetic technology: Impact on amputee rehabilitation. *Journal of Biomedical Engineering*, 2020;62 (2): 110-118.
- Tanveer, M., Hohmann, A., Roy, N., Zeba, A., Tanveer, U., Siener, M. The current prevalence of underweight, overweight, and obesity associated with demographic factors among Pakistan school-aged children and adolescents—An empirical cross-sectional study. *International Journal of Environmental Research and Public Health*, 2022;19(18): 11619.
- Tanveer, M., Tanveer, U., Afzal, M., Rana, N., Nagra, R., Anjum, W., Haseeb, M. Community-Level Factors Associated with Body Mass Index Among Pakistani School-Aged Adolescents. *Pak J Med Health Sci*, 2022; 16(09): 463-463.
- Tanveer, M., Asghar, E., Tanveer, U., Roy, N., Zeba, A., Al-Mhanna, S. B. Batrakoulis, A. Association of nutrition behavior and food intake with overweight and obesity among school-aged children and adolescents in Pakistan: a cross-sectional study. *AIMS Public Health*, 2024;11(3): 803-818.
- Tanveer, M., Tanveer, U., Tanveer, N., Roy, N., Zeba, A., Razaq, F. A. Parental health attitudes and knowledge factors associated with body mass index among Pakistani school-aged adolescents. *Pak J Med Health Sci*; 2022;16(09): 479-479.
- Tanveer, M., Roy, N., Zeba, A., Haider, S., Albarha, N. S., Tanveer, N. & Tanveer, U. Prevalence of Body Mass Index and Associated with Demographic Factors among Pakistan School-Aged Adolescents. *Pak J Med Health Sci*, 2022;16(06): 212-212.
- Tanveer, M., Asghar, E., Tanveer, U., Roy, N., Zeba, A., Al-Mhanna, S. B., & Batrakoulis, A. Community-Level Physical Activity Opportunities, Safe and Supportive Environment Factors, and Their Association with Overweight and Obesity among School-Aged Children and Adolescents in Pakistan—A Cross-Sectional Study. *Kurdish Studies*, 2024;12(2): 6425-6432.
- Roy, N., Tanveer, M., & Liu, Y. H. Stress and coping strategies for international students in China during COVID-19 pandemic. *International Research Journal of Education and Innovation*, 2022;3(1): 1-12.
- Tanveer, M., Tanveer, U., Zeba, A., & Siener, M. U. Prevalence of body mass index and its association with interpersonal family-level factors among school-aged children and adolescents in Pakistan. *Journal of Population Therapeutics and Clinical Pharmacology*, 2024;31(2).
- Moazzam Tanveer, Ejaz Asghar, Umar Tanveer, Nadeem Roy, Asifa Zeba, M Zahid Hameed Khan, Nayab Tanveer, Fouzia Abdul Razaq. Intrapersonal level unhealthy behaviors (smoking, drinking alcohol, and tobacco use) and their association with body mass index among school-aged children and adolescents in Pakistan. *Journal of Population Therapeutics and Clinical Pharmacology*, 2024;31(3): 50–62.
- Tasawar, A, & Tanveer, M. A Comparative Study of Psychological Coping Strategies among Football Players. *Journal of Population Therapeutics and Clinical Pharmacology*, 2024; 31(3): 962–975.
- Akhtar, S., Latif, M., Ahmed, O. S., Sarwar, A., Alina, A., & Khan, M. I. Prevalence of foot ulcers in diabetic patients in Punjab, Pakistan. *Frontiers in Public Health*, 2022;10: 967733.
- Atallah, H., Qureshi, A. Z., Nawaz, S., & Wani, T. Complications of major lower limb amputations before prosthetic provision at a tertiary care rehabilitation facility. *Prosthetics and Orthotics International*, 2022;10-1097.
- Siddiqui, N. A., Khaliq, M. A., Pirzada, M. A., Rehman, Z., Shaikh, F., Riaz, A., Khan, S. Development and content validation of a financial and functional outcomes tool for diabetes-related foot disease in patients undergoing major lower limb amputation: a prospective observational study from Pakistan. *BMJ open*, 2024;14(3): e080853.
- Bandarian, F., Qorbani, M., Nasli-Esfahani, E., Sanjari, M., Rambod, C., & Larijani, B. Epidemiology of diabetes foot amputation and its risk factors in the Middle East Region: A systematic review and meta-analysis. *The International Journal of Lower Extremity Wounds*, 2022;15347346221109057.
- Raina, S. H., & Bhat, R. L. Healthcare service quality in private hospitals of India—an empirical assessment from Jammu and Kashmir State. *World Review of Entrepreneurship, Management and Sustainable Development*, 2018;14(3): 406-416.

This article may be cited as: Pervaiz T, Saleem S, Tahir M, Ahsan Z, Kamran M, Khan AA, Rasool A: Effect of Early Prosthetic Fitting in Patients with Below-Knee Amputation. *Pak J Med Health Sci*, 2024;18(3):16-18.