

Original Research

Quality of Life Among Diabetic Patients Using Transtibial Prostheses: A Descriptive Study

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ABSTRACT

Background Diabetes mellitus (DM) is a chronic condition that increases the risk of foot infections, which may lead to gangrene and, in severe cases, lower limb amputation. Transtibial amputation is among the most common procedures, accounting for approximately 85–90% of all limb amputations. The use of a prosthesis is expected to enhance the quality of life (QoL) of post-amputation patients, yet outcomes may vary based on individual factors and causes of amputation.

Objective This study aimed to assess the quality of life in patients with transtibial prostheses following amputation due to diabetes mellitus.

Methods This descriptive study used observation sheets to evaluate prosthesis usage and the Prosthesis Evaluation Questionnaire (PEQ) to assess quality of life. Participants were transtibial prosthesis users with a history of amputation due to diabetes mellitus.

Results Statistical analysis showed a p -value of 0.606 ($p > 0.05$), indicating no significant difference in quality of life between diabetic amputees and those amputated due to trauma. However, prosthesis use generally contributed to improved mobility and daily functioning.

Conclusion While the cause of amputation (diabetes vs. trauma) did not significantly affect overall quality of life, the use of transtibial prostheses supports functional recovery in post-amputation patients. Further research is needed to explore other factors influencing quality of life outcomes in this population.

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INTRODUCTION

Amputation is the process of removing a portion of the body, a limb, or its entirety. This action is an action carried out in conditions of last resort when organ problems that occur in the extremities are no longer possible to repair using other techniques, or when the condition of the organs can endanger the safety of the client's body as a whole or damage other body organs such as causing infectious complications (healthy enthusiast)(Devi et al., 2018). Currently, lower limb amputations account for 85-90% of all amputations and transtibial amputation is the most frequently performed type of amputation surgery.(Devi et al., 2018). Transtibial amputation is the loss of limb movement below the knee, along the tibia bone which results in a person's inability to carry out functional activities (Setyawan & Fatati, 2024).

One of the causes of amputation is diabetes mellitus. Diabetes mellitus is a chronic condition that results when the pancreas is unable to produce enough insulin or when the body is unable to utilize the insulin that is produced properly. Insulin is a hormone that controls blood sugar levels. Hyperglycemia or increased blood sugar is a common effect of uncontrolled diabetes which causes serious damage to many body systems, especially the nerves and blood vessels (Murtiningsih et al., 2021)). The International Diabetes Federation (IDF) estimates that Indonesia is in 6th place with the number of people with diabetes aged 20-79 years around 10.2 million people in 2017 and is expected to increase to 16.7 million people in 2045 (Murtiningsih et al., 2021). Due to impaired insulin function, people with diabetes mellitus experience elevated blood sugar levels and abnormalities in the metabolism of carbohydrates, lipids, and proteins. This condition is caused by interference or deficiency in insulin production by the Langerhans beta cells of the pancreatic gland, or due to low response of the body's cells to insulin (Ardiani et al., 2021).

Amputation results in a person experiencing permanent disability, thereby bringing about dramatic changes in all aspects of a person's life in their daily activities. Even though amputation aims to save the patient's life and body, many still hurt the patient, namely psychological changes (Nur Rosyid et al., 2020). Amputation results in patients experiencing a feeling of loss of self-confidence. Many are less enthusiastic about living their lives because they cannot carry out their activities as before (Petrini et al., 2019). An individual's quality of life is related to their personal goals, aspirations, and interests. Quality of life is a multifaceted concept that encompasses a variety of dimensions, such as health and physical performance, mental health, social interaction, contentment with care, worries about the future, and sense of well-being. Symptoms of chronic diseases and physical disorders have a direct impact on all aspects of quality of life (Borji et al., 2017)

Treatment of transtibial amputation with Orthotic Prosthetics is by using a transtibial prosthesis. The role of prosthetic orthotics is to provide services for making replacement equipment in the form of prostheses which aim to help restore the function of lost limbs to improve the quality of independence. It is hoped that patients who use a prosthesis can have their limbs equipped so that they can carry out daily activities (Rachmat et al., 2020). For patients with transtibial amputations, the primary goal of rehabilitation is to regain mobility. Patient satisfaction with their prosthesis is crucial for optimizing its use, preventing hesitancy or refusal to use it, and enhancing adherence to its usage. It also plays a significant role in restoring mobility. 40% to 60% of prosthesis users are dissatisfied with their prosthesis, 57% are dissatisfied with the comfort of the

prosthesis and more than 50% report feeling pain when using their prosthesis (Berke et al., 2010).

A prosthesis rejection might be viewed as an initial indication of discontent with it. Up to 31% of prostheses given to soldiers with lower limb amputations fail, mainly because of technical issues. (e.g., “too much noise” when worn and the prosthesis “too heavy”). These findings make dissatisfaction with transtibial prostheses a very relevant issue in the treatment of lower extremity amputations (Gailey et al., 2010).

This study aimed to determine the effect of using a transtibial prosthesis on the quality of life of patients using a transtibial prosthesis due to diabetes mellitus. Apart from that, the specific aim of this research is to accommodate amputees to continue carrying out activities to improve the quality of life in the health sector without causing complications.

METHOD

This research uses a quantitative method, analytical observational research with a cross-sectional design, to determine the effect of using a prosthesis on the quality of life of patients using a transtibial prosthesis.

The population in this study were users of transtibial prostheses in Surakarta, while the sample from this study was users of transtibial prostheses caused by amputation due to diabetes mellitus and trauma. Fifteen individuals participated in this study. The author employed a non-probability sampling method with purposive sampling in this study. Purposive sampling is a technique for selecting respondents to be sampled according to specific criteria. The criteria applied include inclusion and exclusion criteria. The inclusion criteria were patients using transtibial prostheses due to diabetes mellitus, while the exclusion criteria did not participate in the study as a whole and had another deformity.

The measuring tool used to measure quality of life is the Prosthesis Evaluation Questionnaire (PEQ). The normality test used is Shapiro Wilk because the amount of data is less than 50. Some data is not normally distributed, so the data is considered not normal and the hypothesis test used is the Independent T-Test. Ethical permission has been granted by 'Aisyiyah Surakarta University under Number. 232/VIII/AUEC/2024

RESULTS

1. General Description.

Research on the Effect of Using a Transtibial Prosthesis on the Quality of Life of Post-Amputation Patients Due to Diabetes Mellitus was carried out at the independent Orthotic Prosthetic clinic in Surakarta and surrounding areas. The time used for the research was March 2024 – November 2024. The subjects in this study were 15 transtibial prosthesis users. This research aims to determine whether there is an effect of using a transtibial prosthesis on the quality of life of post-amputation patients due to diabetes mellitus.

Based on the data obtained, the numbers and percentages obtained based on gender showed that transtibial prosthesis users with the highest gender frequency were 12 people (80%).

Table 1. Subject Characteristics Based on Gender

Gender	Frequency	Percentage (%)
Male	12	80
Female	3	20
Total	15	100

Source: primary data.

Distribution of data based on age shows that transtibial prosthesis users with the highest frequency based on age are in the range of 41 – 50 years (40%).

Table 2. Subject Characteristics Based on Age

Age	Frequency	Percentage (%)
21 – 30	1	7
31 – 40	4	27
41 – 50	6	40
51 – 60	2	13
61 – 70	2	13
Total	15	100

Source: primary data.

The distribution of respondents based on body mass index showed that most transtibial prosthesis users had a BMI of 18.5-25, 7 people (46.7%). According to the Ministry of Health's national classification, this value is in the normal category.

Table 3. Subject Characteristics Based on Body Mass Index

BMI	Frequency	Percentage (%)
17.0 – 18.4	0	0
18.5 – 25.0	7	46.7
25.1 – 27.0	6	40
> 27	2	13.3
Total	15	100

Source: primary data.

Subject characteristics based on the cause of amputation showed that transtibial prosthesis users with the most frequent causes of amputation were accidents, 11 people (73.3%).

Table 4. Subject Characteristics Based on Cause of Amputation

Cause of Amputation	Frequency	Percentage (%)
Trauma	11	73.3
Diabetes mellitus	4	26.7
Total	15	100

Source: primary data.

Subject characteristics based on quality-of-life scores showed that transtibial prosthesis users with the highest quality of life were 7 people (47%).

Table 5. Subject Characteristics Based on Quality-of-Life Scores

Quality of Life Scores	Frequency	Percentage (%)
Score 1-2	0	0
Score 3-4	0	0
Score 5-6	3	20
Score 7-8	7	47
Score 9-10	5	33
Total	15	100

Source: primary data.

Table 6 shows that transtibial prosthesis users with the lowest quality of life are those with a quality score of 7-8, amounting to 3 people (75%). The quantity and proportion of quality of life assessed based on the reason for amputation resulting from trauma are as follows:

Table 6. Subject Characteristics Based on Quality-of-Life Scores

Cause of Amputation	Quality of Life Scores	Frequency	Percentage (%)
Trauma	Score 1-2	0	0
	Score 3-4	0	0
	Score 5-6	3	20
	Score 7-8	4	26.6
	Score 9-10	4	26.6
Diabetes mellitus	Score 1-2	0	0
	Score 3-4	0	0
	Score 5-6	0	0
	Score 7-8	3	20
	Score 9-10	1	6.6
Total		15	100

Source: primary data

Subject characteristics based on the quality of life with the cause of amputation due to diabetes mellitus, the quality of life of transtibial prosthesis users due to diabetes mellitus is better than due to accidents.

Table 7. Subject Characteristics Based on Quality-of-Life Scores

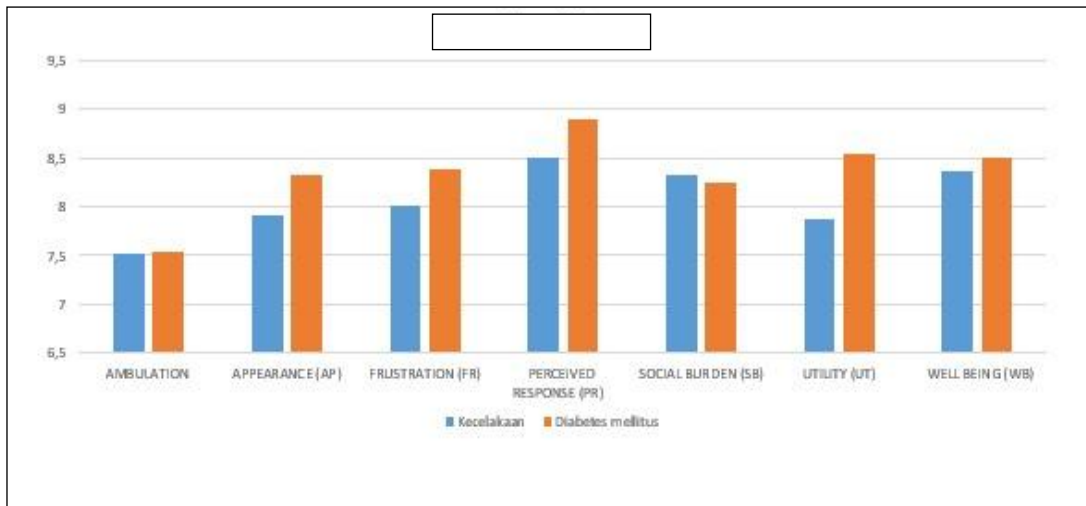
Quality-of-life	N	Mean
Trauma	11	8.0682
Diabetes mellitus	4	8.3475
Total	15	100

Source: primary data

2. Distribution of quality-of-life indicators.

Based on the data obtained, the quality-of-life indicators obtained based on the causes of amputation due to diabetes mellitus and accidents show that the quality-of-life components in transtibial prosthesis users are at the same level as the ambulation components.

Graphic 1. Distribution of quality-of-life indicators



Source: primary data

3. Data analysis.

In this study, the sample consisted of 15 people, so the normality test used was the Shapiro-Wilk test. The results of the normality test using the Shapiro-Wilk test have a p-value of 0.054 and 0.111 (> 0.05) for the variables causing amputation due to accidents and diabetes mellitus, so it can be interpreted that all variables are normally distributed.

Table. 8 Result of Normality Test

	Cause of Amputation	<i>p-value</i>	α	Interpretation
Quality-of-life	Accidents	0.054	0.05	Normal
	Diabetes mellitus	0.111		Normal

Source: primary data

The results of the independent sample T-test on the quality of life of patients using transtibial prostheses caused by accidents and diabetes mellitus obtained a p-value of 0.606 where the $p\text{-value} > 0.05$, it can be concluded that there is no difference in the quality of life of transtibial prosthesis users caused by accidents and diabetes mellitus.

Table. 9 Result of Independent Sample T-test

Cause of Amputation		<i>p-value</i>
Quality-of-life	Accidents Diabetes mellitus	0.606

Source: primary data

DISCUSSION

The study entitled The Effect of Transtibial Prosthesis Use on the Quality of Life of Post-Amputation Patients Due to Diabetes Mellitus found that in measuring the quality of life using the Prosthesis Evaluation Questionnaire (PEQ) in respondents with the cause of amputation due to trauma, the results showed that the quality-of-life score was 7-10 for 8 out of 11 respondents. This demonstrates that patients who utilize transtibial prostheses due to accidents can experience an improved quality of life. While in respondents with the cause of amputation due to Diabetes mellitus, the results showed that the quality-of-life score was 7-10 for 4 out of 4 respondents. This shows that the use of transtibial prostheses can improve the quality of life of patients using transtibial prostheses due to diabetes mellitus.

The results of the analysis test showed a *p-value* of 0.606 where *the p-value* (> 0.05), it can be concluded that there is no difference in the quality of life of respondents who use transtibial prostheses with the cause of amputation due to accidents or diabetes mellitus. This is because many factors affect the quality of life of post-amputation patients, according to research by Putri & Salsabila in 2021, the factors that affect the quality of life after amputation are as follows: gender, use of prosthesis, duration of amputation, age, level of amputation, and social status. There are two types of quality-of-life indicators, namely subjective and objective indicators . For example, objective indicators can be income as a reference, while subjective indicators such as happiness, which is a personal or individual assessment that is subjective (Yohanes Kiling & Novianti Kiling-Bunga, 2019).

The average quality of life value of transtibial users with a history of diabetes in this study was 8.3475 while those with trauma were 8.0692. This shows that the use of prostheses in amputees with a history of diabetes has a quality of life that is no less good than the group whose amputation was caused by trauma. In line with the research of von Kaepler, 2021 which concluded that the use of a prosthesis in someone who has had an amputation can improve the quality of life and functional status in both patients with a history of vascular and non-vascular (von Kaepler et al., 2021).

Based on the data obtained from the instrument in this study, it is known that the indicator that most influence the results is perceived response, which is the level of satisfaction from the response of people around the prosthesis user towards him. This is following Eskridge's research which states that satisfaction has a positive correlation with the quality of life of transtibial prosthesis users, where the higher the satisfaction value, the higher the quality of life (Eskridge et al., 2022). The ambulation ability indicator has an average value of 7,5. According to Munin's 2001 study, the ambulation ability of prosthesis users is determined by several factors including the cause of amputation and the length of use of the prosthesis (Munin et al., 2001). A similar thing was also obtained in Miller's 2023 study which showed that there are factors that

influence the ambulation ability of prosthesis users, namely the length of time the prosthesis has been used, age, gender, and the cause of amputation (Miller et al., 2023).

The results of this study indicate that there is no difference in quality of life between the causes of diabetic amputation and trauma, so it can be interpreted that the condition of prosthesis use in amputee patients due to diabetes can improve the quality of life. According to Juzwizyn et al. (2022), the level of quality of life of prosthesis users with a history of diabetes is greatly determined by age and nutritional status, so it is very important for diabetics who have amputations to be able to maintain their intake patterns so that their quality of life can improve (Juzwizyn et al., 2022).

In this study, mental health factors were not studied, this is not following the research of Pedras et al. (2020) which states that the quality of life of someone who has an amputation due to diabetes is greatly influenced by physical and mental factors so that intervention is needed for mental rehabilitation to improve their quality of life (Pedras et al., 2020). Based on the definition, quality of life is how someone interprets their role as a man or woman in their life, which is influenced by the culture and social structure around them, and has an impact on their level of happiness, aspirations, joy, and fear (Ardiani et al., 2021). Quality of life is an individual's understanding of their existence, including the sustainability of physical well-being, social life, and mental health, along with the individual's ability to manage their daily routines (Panjaitan, 2022). Therefore, it is important for subsequent research to conduct interventions related to mental health to obtain more comprehensive results.

CONCLUSION

Research on the Effect of Transtibial Prosthesis Use on the Quality of Life of Post-Amputation Patients Due to Diabetes Mellitus with 15 subjects conducted at an independent clinic in Surakarta and its surroundings in March - November 2024. The results of the normality test using the Shapiro Wilk test have a p value of 0.054 and 0.111 (> 0.05) on the variables of causes of amputation due to accidents and diabetes mellitus, so it can be interpreted that all variables are normally distributed

The results of the independent sample T-test on the quality of life of patients using transtibial prostheses caused by accidents and diabetes mellitus obtained a p-value of 0.606 where the p-value > 0.05 , it can be concluded that there is no difference in the quality of life of transtibial prosthesis users caused by accidents and diabetes mellitus.

This shows that the use of prostheses in amputees with a history of diabetes has a quality of life that is no less good than the group whose amputation was caused by trauma

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REFERENCES

- Ardiani, H. E., Permatasari, T. A. E., & Sugiati, S. (2021). Obesitas, Pola Diet, dan Aktifitas Fisik dalam Penanganan Diabetes Melitus pada Masa Pandemi Covid-19. *Muhammadiyah Journal of Nutrition and Food Science (MJNF)*, 2(1), 1. <https://doi.org/10.24853/MJNF.2.1.1-12>
- Berke, G. M., Ferguson, J., Milani, J. R., Hattingh, J., McDowell, M., Nguyen, V., & Reiber, G. E. (2010). Comparison of satisfaction with current prosthetic care in veterans and servicemembers from Vietnam and OIF/OEF conflicts with major traumatic limb loss. *Journal of Rehabilitation Research & Development*, 47(4), 361–372. <https://doi.org/10.1682/JRRD.2009.12.0193>
- Borji, M., Otaghi, M., & Kazembeigi, S. (2017). The impact of Orem's self-care model on the quality of life in patients with type II diabetes. *Biomedical and Pharmacology Journal*, 10(1), 213–220. <https://doi.org/10.13005/BPJ/1100>
- Devi, M., Santi, M., Politeknik, R., Kementarian, K., Surakarta, K., & Prostetik, J. O. (2018). Gambaran Body Image Pasien Pasca Amputasi Transtibial Setelah Menggunakan Transtibial Prosthesis. *Jurnal Keterampilan Fisik*, 3(2), 89–99. <https://doi.org/10.37341/JKF.V3I2.113>
- Eskridge, S. L., Dougherty, A. L., Watrous, J. R., McCabe, C. T., Cancio, J. M., Mazzone, B. N., & Galarneau, M. R. (2022). Prosthesis satisfaction and quality of life in US service members with combat-related major lower-limb amputation. *Prosthetics and Orthotics International*, 46(1), 68–74. <https://doi.org/10.1097/PXR.0000000000000054>
- Gailey, R., Mcfarland, L. V., Cooper, R. A., Czerniecki, J., Gambel, J. M., Hubbard, S., Maynard, C., Smith, D. G., Raya, M., & Reiber, G. E. (2010). Unilateral lower-limb loss: Prosthetic device use and functional outcomes in servicemembers from Vietnam war and OIF/OEF conflicts. *Journal of Rehabilitation Research & Development*, 47(4), 317–332. <https://doi.org/10.1682/JRRD.2009.04.0039>
- Juzwiszyn, J., Łabuń, A., Tański, W., Szymańska-Chabowska, A., Zielińska, D., & Chabowski, M. (2022). Acceptance of illness, quality of life and nutritional status of patients after lower limb amputation due to diabetes mellitus. *Annals of Vascular Surgery*, 79, 208–215. <https://doi.org/10.1016/j.avsg.2021.07.023>
- Nur Rosyid, F., Kristinawati, B., & Ayu Kurnia, D. (2020). Kadar Glukosa Darah Puasa dan Dihubungkan dengan Kualitas Hidup pada Pasien Ulkus Kaki Diabetik. *Jurnal Keperawatan Silampari*, 3(2), 500–509. <https://doi.org/10.31539/JKS.V3I2.1131>
- Miller, T. A., Paul, R., Forthofer, M., & Wurdeman, S. R. (2023). Factors that influence time to prosthesis receipt after lower limb amputation: A Cox proportional hazard model regression. *PM&R*, 15(4), 474–481. <https://doi.org/10.1002/PMRJ.12781>
- Munin, M. C., Carolina, M., Guzman, E.-D., Boninger, M. L., Fitzgerald, S. G., Penrod, L. E., & Singh, J. (2001). Predictive factors for successful early prosthetic ambulation among lower-limb amputees. *Journal of Rehabilitation Research and Development*, 38(4), 379–384.
- Murtiningsih, M. K., Pandelaki, K., & Sedli, B. P. (2021). Gaya Hidup sebagai Faktor Risiko Diabetes Melitus Tipe 2. *E-Clinic*, 9(2), 328–333. <https://doi.org/10.35790/ECL.V9I2.32852>

- Panjaitan, G. (2022). *Hubungan Dukungan Keluarga Dengan Kualitas Hidup Lansia Di Desa Pintubatu Kecamatan Silaen Tahun 2022*.
- Pedras, S., Vilhena, E., Carvalho, R., & Pereira, M. G. (2020). Quality of Life Following a Lower Limb Amputation in Diabetic Patients: A Longitudinal and Multicenter Study. *Psychiatry*, 83(1), 47–57. <https://doi.org/10.1080/00332747.2019.1672438>
- Petrini, F. M., Valle, G., Bumbasirevic, M., Barberi, F., Bortolotti, D., Cvancara, P., Haiarrassary, A., Mijovic, P., Sverrisson, A. Ö., Pedrocchi, A., Divoux, J. L., Popovic, I., Lechler, K., Mijovic, B., Guiraud, D., Stieglitz, T., Alexandersson, A., Micera, S., Lesic, A., & Raspopovic, S. (2019). Enhancing functional abilities and cognitive integration of the lower limb prosthesis. *Science Translational Medicine*, 11(512). https://doi.org/10.1126/SCITRANSLMED.AAV8939/SUPPL_FILE/AAV8939_S M.PDF
- Rachmat, N., Syafi'i, M., Kemenkes, P., Jurusan, S., & Prostetik, O. (2020). Pengaruh Transtibial Prosthesis terhadap Activity Of Daily Living Pasien Amputasi Bawah Lutut. *Interest : Jurnal Ilmu Kesehatan*, 9(1), 56–62. <https://doi.org/10.37341/INTEREST.V9I1.153>
- Setyawan, D., & Fatati, M. (2024). Hubungan Jenis Prosthetic Foot Terhadap Hiperekstensi Dan Kelemahan Ligamen Pada Pengguna Prosthesis Transtibial: Indonesian. *Medical Journal of Nusantara*, 3(2), 105–112. <https://doi.org/10.55080/MJN.V3I2.895>
- von Kaeppler, E. P., Hetherington, A., Donnelley, C. A., Ali, S. H., Shirley, C., Challa, S. T., Lutyens, E., Haonga, B. T., Morshed, S., Andrysek, J., & Shearer, D. W. (2021). Impact of prostheses on quality of life and functional status of transfemoral amputees in Tanzania. *African Journal of Disability*, 10, 839. <https://doi.org/10.4102/AJOD.V10I0.839>
- Yohanes Kiling, I., & Novianti Kiling-Bunga, B. (2019). Pengukuran dan Faktor Kualitas Hidup pada Orang Usia Lanjut. *Journal of Health and Behavioral Science*, 1(3), 149–165.