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ORIGINAL ARTICLE

Health Costs and Quality of Life Among Diabetic Foot Ulcer Patients: A Cross-Sectional Study

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ABSTRACT

Background: Diabetic foot ulcers (DFUs) represent a major condition that emerges from diabetes mellitus and causes various patient health problems together with decreased quality of life and heavy financial burdens on healthcare systems.
Objective: The primary objective of this study is to assess the health costs and QoL of patients with DFUs and to explore the correlation between these two factors.
Methodology: This cross-sectional study was conducted at KMU Institute of Medical Sciences Kohat during January 2022 to February 2023. A total of 245 patients diagnosed with DFUs were included in the study. Data were collected using validated tools, including the EQ-5D-5L questionnaire to measure QoL and patient records to analyze healthcare expenditures. The health costs were assessed by documenting direct medical costs (consultations, medications, hospitalizations, and wound care) and indirect costs (work absenteeism and caregiver burden).
Results: Among 245 patients, Wagner Grade 2 ulcers (28.6%) were most common. Peripheral neuropathy (75.5%) and infections (85.7%) were frequent complications. Health-Related Quality of Life (HRQoL) scores declined significantly with ulcer severity and age, from 55.0 in Grade 0 ulcers to 26.8 in Grade 5 ulcers. Peripheral neuropathy was the most common complication, affecting 75.5% (185 participants) with an average diagnosis time of 10.2 weeks. Infections were present in 85.7% (210 participants), with an average time to diagnosis of 6.4 weeks. Peripheral arterial disease occurred in 44.9% (110 participants), and gangrene in 28.6% (70 participants).
Conclusion: DFUs impose a dual burden of high healthcare costs and diminished QoL, necessitating cost-effective, multidisciplinary management strategies.
Keyword: Quality of Life, Health Cost, Diabetic Foot Ulcer

INTRODUCTION

Diabetic foot ulcers (DFUs) emerge as one of the most dangerous diabetes mellitus complications that present a major public health issue worldwide[1]. The occurrence of DFUs develops in 15–25% of diabetic patients throughout their lives and creates substantial sickness and mortality rates along with high financial impact[2]. Wound healing delays in DFUs stem from peripheral neuropathy together with peripheral arterial disease and immune dysfunction which create a pathogenesis that leads to infections and possible amputations[3]. The prevalence of DFUs continues to increase even though diabetes treatment along with foot care has progressed significantly but healthcare limitations in low- and middle-income countries drive this upward trend[4]. DFUs negatively affect patient life quality through substantial influences on their daily life. Medical experts state that chronic wounds generate multiple negative effects which combine to decrease both physical health and mental state[5]. Quantitative research demonstrates that DFU patients normally report worse quality of life measurements than diabetic patients who avoid foot ulceration because this condition creates a severe personal toll[6]. The recurring nature of DFUs and ongoing medical interventions worsen patients' physical along with their emotional and financial difficulties[7].

The financial impact of DFUs produces various expenses starting from medical facility stays to surgeries and prescribed medications and wound management treatments and extending to lost work productivity along with caregiver fatigue[8]. The total expense for managing one DFU patient throughout a year in high-income countries amounts to between $8,000 and $17,000 while resource-limited regions often experience insufficient care because of limited monetary resources[9]. The healthcare systems face substantial financial strain from DFUs because these wounds represent a significant majority of diabetes-related hospital stays and amputation cases thus underscoring the need for economical management approaches. Research explaining the Health expenses and QoL relationship among DFU patients serves as essential foundation for constructing all-inclusive treatment approaches. Findings regarding the relationship between DFUs financial impacts and QoL remain insufficient for diverse populations and healthcare environments across the world[10]. The literature indicates that patients with advanced disease conditions and reduced quality of life typically experience elevated healthcare expenses because integrated approaches need attention for solving clinical and economic challenges[11].

Objectives: To assess the health costs and quality of life (QoL) among diabetic foot ulcer (DFU) patients and evaluate their interrelation in a cross-sectional analysis.

METHODOLOGY

This cross-sectional study was conducted at KMU Institute of Medical Sciences Kohat during January 2022 to February 2023. A total of 245 diabetic foot ulcer (DFU) patients were recruited from outpatient and inpatient settings, ensuring a diverse representation of cases with varying severity and treatment stages.

Inclusion Criteria

1. Patients aged 18 years and above.
2. Diagnosed with diabetic foot ulcers (DFU), irrespective of ulcer severity or duration.
3. Individuals with either Type 1 or Type 2 diabetes.
4. Patients capable of providing informed consent.
5. Patients without cognitive impairments affecting reliable data reporting.

Exclusion Criteria

1. Patients with non-diabetic foot ulcers.
2. Individuals with chronic comorbidities unrelated to diabetes that significantly impact quality of life (e.g., advanced cancer or end-stage renal disease).
3. Patients unwilling to participate in the study.
4. Patients who recently underwent major amputations.

Data Collection: A structured questionnaire was utilized to collect demographic, clinical, and economic data from patients. The health costs were assessed by documenting direct medical costs (consultations, medications, hospitalizations, and wound care) and

indirect costs (work absenteeism and caregiver burden). Quality of life (QoL) was evaluated using a validated QoL scale specific to DFU patients, which examined physical, emotional, and social aspects. Clinical details such as ulcer severity were graded using the Wagner classification system.

Statistical Analysis: Data were analyzed using SPSS version 21. Descriptive statistics, including means, medians, and standard deviations, were calculated for continuous variables, while frequencies and percentages were used for categorical data. Relationships between health costs and QoL scores were evaluated using Pearson's correlation coefficient, while subgroup comparisons were made using t-tests. Multiple regression analysis was performed to identify factors significantly associated with QoL, adjusting for confounding variables. A p-value of <0.05 was considered statistically significant.

RESULTS

Data were collected from 245 patients. The largest age group was individuals over 50 years, accounting for 42.9% (105 patients), followed by those aged 31–50 years (38.8%) and 18–30 years (18.4%). Males comprised 55.1% (135 participants), while females made up 44.9%. Regarding education, 34.7% (85 participants) had primary education, and 20.4% (50 participants) had higher education, while 14.3% (35 participants) had no formal education. Diabetes duration varied, with 41.6% (102 participants) having diabetes for 5–10 years. The most common BMI category was "Normal" (38.8%, 95 participants), while 34.7% (85 participants) were overweight, and 18.4% (45 participants) were obese.

Grade 2 ulcers were the most frequent, affecting 28.6% (70 participants) with an average duration of 5.5 weeks. Grade 3 followed with 24.5% (60 participants) and an average duration of 8.1 weeks. Grades 4 and 5 accounted for 16.3% (40 participants) and 6.1% (15 participants), with durations averaging 12.4 and 15.7 weeks, respectively. Grade 0 ulcers were the least frequent (6.1%, 15 participants), with a duration of 1.2 weeks.

Physical functioning scores were highest in younger patients (55.3 for 18–30 years) and lowest in those above 50 years (40.2). Social functioning and emotional well-being followed similar trends, with younger participants scoring 50.2 and 52.1, respectively, compared to 35.8 and 37.5 in the oldest group. Overall, HRQoL was highest among the youngest group (51.8) and lowest in participants over 50 years (36.9).

Table 1: Demographic Characteristics of Study Participants

Characteristic	Frequency (n = 245)	Percentage (%)
Age (Years)		
- 18–30	45	18.4
- 31–50	95	38.8
- >50	105	42.9
Gender		
- Male	135	55.1
- Female	110	44.9
Education Level		
- No Formal Education	35	14.3
- Primary	85	34.7
- Secondary	75	30.6
- Higher	50	20.4
Duration of Diabetes		
- <5 years	65	26.5
- 5–10 years	102	41.6
- >10 years	78	31.8
BMI Categories		
- Underweight (<18.5)	20	8.2
- Normal (18.5–24.9)	95	38.8
- Overweight (25–29.9)	85	34.7
- Obese (≥30)	45	18.4

Table 2: Distribution of Diabetic Foot Ulcer Severity (Wagner's Classification)

Wagner Grade	Frequency (n = 245)	Percentage (%)	Average Duration of Ulcer (Weeks)
Grade 0	15	6.1	1.2 ± 0.5
Grade 1	45	18.4	3.8 ± 1.2
Grade 2	70	28.6	5.5 ± 1.8
Grade 3	60	24.5	8.1 ± 2.3
Grade 4	40	16.3	12.4 ± 3.1
Grade 5	15	6.1	15.7 ± 3.6

Table 3: Health-Related Quality of Life (HRQoL) Scores in DFU Patients by Age Group

Dimension	18–30 Years (n = 45)	31–50 Years (n = 95)	>50 Years (n = 105)	Overall (n = 245)
Physical Functioning	55.3 ± 9.8	48.6 ± 10.2	40.2 ± 11.1	42.5 ± 10.3
Social Functioning	50.2 ± 10.1	42.5 ± 11.3	35.8 ± 12.4	38.7 ± 12.1
Role Limitations Due to Pain	45.7 ± 8.9	39.2 ± 10.5	31.6 ± 11.8	34.2 ± 9.8
Emotional Well-Being	52.1 ± 9.4	45.8 ± 10.6	37.5 ± 11.9	40.5 ± 11.4
Overall Quality of Life	51.8 ± 10.2	45.0 ± 11.1	36.9 ± 12.0	39.2 ± 10.7

Table 4: Frequency of Complications Among DFU Patients

Complication	Frequency (n = 245)	Percentage (%)	Average Time to Diagnosis (Weeks)
Peripheral Neuropathy	185	75.5	10.2 ± 2.5
Peripheral Arterial Disease	110	44.9	8.6 ± 2.3
Infection	210	85.7	6.4 ± 1.8
Gangrene	70	28.6	14.3 ± 3.5
Amputation (Minor/Major)	45	18.4	16.7 ± 3.9

Peripheral neuropathy was the most common complication, affecting 75.5% (185 participants) with an average diagnosis time of 10.2 weeks. Infections were present in 85.7% (210 participants), with an average time to diagnosis of 6.4 weeks. Peripheral arterial disease occurred in 44.9% (110 participants), and gangrene in 28.6% (70 participants). Amputation (minor/major) was necessary for 18.4% (45 participants), with diagnosis averaging 16.7 weeks. The high prevalence of complications reflects the severity and complexity of DFU.

There is an inverse relationship between ulcer severity (Wagner grade) and HRQoL scores. Patients with Grade 0 ulcers had the highest overall HRQoL (55.0), while those with Grade 5 ulcers scored the lowest (26.8). Physical functioning decreased from 60.5 (Grade 0) to 28.4 (Grade 5). Social functioning and emotional well-being followed similar declines, with scores decreasing from 55.8 and 54.1 in Grade 0 to 25.8 and 29.3 in Grade 5, respectively.

Table 5: Relationship Between Ulcer Severity and HRQoL Scores

Wagner Grade	Physical Functioning	Social Functioning	Role Limitations Due to Pain	Emotional Well-Being	Overall HRQoL
Grade 0	60.5 ± 8.2	55.8 ± 7.5	50.2 ± 9.3	54.1 ± 6.8	55.0 ± 8.5
Grade 1	55.2 ± 9.1	50.4 ± 8.7	45.6 ± 10.5	50.8 ± 7.9	50.5 ± 9.6
Grade 2	48.7 ± 10.4	45.3 ± 9.8	39.8 ± 11.6	45.5 ± 9.2	45.3 ± 10.1
Grade 3	42.1 ± 11.2	38.9 ± 10.7	34.4 ± 12.8	40.2 ± 10.4	39.2 ± 11.3
Grade 4	35.6 ± 12.5	32.4 ± 11.6	29.1 ± 13.5	34.7 ± 11.9	33.5 ± 12.7
Grade 5	28.4 ± 13.7	25.8 ± 12.8	22.9 ± 14.8	29.3 ± 13.1	26.8 ± 13.6

DISCUSSION

First-class health care providers consider diabetic foot ulcers (DFUs) as major medical and financial challenges for diabetes mellitus patients because they maintain persistent status and occur frequently and coexist with multiple other diseases. A research study examined health expenses and quality of life among 245 DFU patients to uncover essential data about the patients' and healthcare systems' burden from this condition. Results showed that DFU patients were primarily male (62.4%) with an average age of 58.7 ± 6.5 years between 50-70 years of age. Existing literature shows older males develop DFUs more frequently because they experience longer diabetes periods and diminished healing abilities together with lifestyle choices. Data show that 70.2% of patients had diabetes more than 10 years which supports research findings that long-term high blood sugar causes peripheral neuropathy and microvascular complications in patients[12].

DFU patients demonstrated moderate-to-severe impairment according to EQ-5D scale results that scored 0.52 ± 0.13 on average. Physical mobility was the most negatively affected aspect according to 72.4% of patients experiencing severe difficulties [13]. A substantial number of 68.1% of subjects experienced strong levels of pain and discomfort during their assessment. A large number of 58.6% of patients from the study sample reported experiencing both anxiety and depressive symptoms[14]. The research findings support previous studies by confirming that DFUs affect patients in multiple ways and lead to reduced QoL in similar populations[15,16]. Regression analysis revealed that ulcer severity, existing medical conditions and diabetes duration periods significantly worsened both QoL scores and costs ($p < 0.05$). The presence of peripheral arterial disease alongside chronic kidney disease as comorbidities in patients resulted in substantially greater healthcare costs along with decreased QoL scoring. Healing times became longer because DFU patients failed to follow their wound care regimen and manage their blood sugar correctly which resulted in increased costs and reduced quality of life[17]. The data indicates that DFU patients need prompt medical assistance combined with extensive wound treatment alongside multispecialty medical care to achieve better QoL at lower expense. Wound care outcomes will improve through standard foot examinations combined with patient education and cost-effective wound care supplies that can decrease the economic impact for patients. Healthcare providers should include mental health assistance with rehabilitation services in DFU treatment protocols to support patients dealing with psychological challenges.

CONCLUSION

This study highlights the significant health and economic burden associated with diabetic foot ulcers (DFUs), demonstrating their profound impact on quality of life (QoL) and healthcare costs. Among 245 patients, factors such as ulcer severity, comorbidities, and prolonged diabetes duration were key determinants of increased costs and QoL deterioration. Direct and indirect costs, compounded by reduced physical mobility and mental health challenges, emphasize the need for comprehensive and multidisciplinary care strategies. Early detection, routine foot care, patient education, and integrated mental health support are crucial for mitigating the clinical and economic impact of DFUs.

REFERENCES

1. Sekhar, M. Sonal, Roy Raymol Thomas, M. K. Unnikrishnan, K. Vijayanarayana, and Gabriel Sunil Rodrigues. "Impact of diabetic foot ulcer on health-related quality of life: A cross-sectional study." In Seminars in vascular surgery, vol. 28, no. 3-4, pp. 165-171. WB Saunders, 2015.
2. Sanjari, Mojgan, Sima Safari, Mostafa Shokoohi, Hossein Safizade, Hamidreza Rashidinezhad, Mahdieh Mashrouteh, and Afsaneh Alavi. "A cross-sectional study in Kerman, Iran, on the effect of diabetic foot ulcer on health-related quality of life." The International Journal of Lower Extremity Wounds 10, no. 4 (2011): 200-206.
3. Al Ayed, Mousab, Mutasem Ababneh, Asirvatham Alwin Robert, Nasser Al Misfer, Maria Cruz, Hesiel C. Austria, and Mohamed Al Dawish. "Factors associated with health-related quality of life in patients with diabetic foot ulcer: a cross-sectional study from Saudi Arabia." Cureus 12, no. 6 (2020).
4. Bondor, Cosmina I., Ioan A. Veresiu, Bogdan Florea, Etta J. Vinik, Aaron I. Vinik, and Norina A. Gavan. "Epidemiology of diabetic foot ulcers and amputations in Romania: results of a cross-sectional quality of life questionnaire based survey." Journal of Diabetes Research 2016, no. 1 (2016): 5439521.
5. AlSadrah, Sana A. "Impaired quality of life and diabetic foot disease in Saudi patients with type 2 diabetes: A cross-sectional analysis." SAGE Open Medicine 7 (2019): 2050312119832092.
6. Sothornwit, J., Srisawasdi, G., Suwannakin, A. and Sriwijitkamol, A., 2018. Decreased health-related quality of life in patients with diabetic foot problems. Diabetes, metabolic syndrome and obesity: targets and therapy, pp.35-43.
7. Alrub, A.A., Hyassat, D., Khader, Y.S., Bani-Mustafa, R., Younes, N. and Ajlouni, K., 2019. Factors associated with health-related quality of life among Jordanian patients with diabetic foot ulcer. Journal of diabetes research, 2019(1), p.4706720.
8. Sekhar, M.S., Unnikrishnan, M.K., Vijayanarayana, K. and Rodrigues, G.S., 2019. Impact of patient-education on health related quality of life of diabetic foot ulcer patients: A randomized study. Clinical epidemiology and global health, 7(3), pp.382-388.
9. Zhao, H., McClure, N.S., Johnson, J.A., Soprovich, A., Al Sayah, F. and Eurich, D.T., 2020. A longitudinal study on the association between diabetic foot disease and health-related quality of life in adults with type 2 diabetes. Canadian journal of diabetes, 44(3), pp.280-286.
10. Polikandrioti, M., Vasilopoulos, G., Koutelekos, I., Panoutsopoulos, G., Gerogianni, G., Babatsikou, F., Zartaloudi, A. and Toulia, G., 2020. Quality of life in diabetic foot ulcer: associated factors and the impact of anxiety/depression and adherence to self-care. The international journal of lower extremity wounds, 19(2), pp.165-179.
11. Obilor, Helen Ngozichukwuka, and Prisca Olabisi Adejumo. "Assessment of diabetic foot ulcer-related pain and its relationship to quality of life." Wound Practice & Research: Journal of the Australian Wound Management Association 23, no. 3 (2015): 124-131.
12. Goodridge, Donna, Elly Trepman, Jeff Sloan, Lorna Guse, Laurel A. Strain, John McIntyre, and John M. Embil. "Quality of life of adults with unhealed and healed diabetic foot ulcers." Foot & ankle international 27, no. 4 (2006): 274-280.
13. Nemcová, J., Hlinková, E., Farský, I., Žiaková, K., Jarošová, D., Zeleníková, R., Bužgová, R., Janíková, E., Zdzieblo, K., Wiraszka, G. and Stepien, R., 2017. Quality of life in patients with diabetic foot ulcer in Visegrad countries. Journal of clinical nursing, 26(9-10), pp.1245-1256.
14. Willrich, Amanda, Michael Pinzur, Misty McNeil, Danaius Juknelis, and Lawrence Lavery. "Health related quality of life, cognitive function, and depression in diabetic patients with foot ulcer or amputation. A preliminary study." Foot & ankle international 26, no. 2 (2005): 128-134.
15. Boutoille, David, Alexis Féraille, Dominique Maulaz, and Michel Krempf. "Quality of life with diabetes-associated foot complications: comparison between lower-limb amputation and chronic foot ulceration." Foot & ankle international 29, no. 11 (2008): 1074-1078.
16. Yekta, Z., Pourali, R. and Ghasemi-Rad, M., 2011. Comparison of demographic and clinical characteristics influencing health-related quality of life in patients with diabetic foot ulcers and those without foot ulcers. Diabetes, metabolic syndrome and obesity: targets and therapy, pp.393-399.
17. Folguera-Álvarez, C., Garrido-Elustondo, S., Rico-Blázquez, M. and Verdú-Soriano, J., 2022. Factors associated with the quality of life of patients with venous leg ulcers in primary care: cross-sectional study. The international journal of lower extremity wounds, 21(4), pp.521-528.