

Determinants of quality of life among older adults with recurrent diabetic foot ulcers

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ABSTRACT

Introduction: Diabetic foot ulcers (DFUs) are a serious complication of diabetes mellitus. DFUs have a profound impact on patients' health-related quality of life (HRQoL). This study aimed to evaluate age-related variations in HRQoL and to identify factors associated with physical and mental health among patients with recurrent DFUs.

Materials and Methods: A cross-sectional study was conducted among 245 patients with type 2 diabetes mellitus. HRQoL was measured using the Indonesian version of the SF-36, whereas depression, diabetes distress, and self-care adherence were evaluated using the Beck Depression Inventory II (BDI-II), the Diabetes Distress Scale-17 (DDS-17), and the Summary of Diabetes Self-Care Activities (SDSCA), respectively. Data were analysed using bivariate tests and multivariate linear regression.

Results: Older adults (≥ 60 years) had significantly lower physical functioning and general health scores ($p < 0.05$). Depression ($\beta = -0.48$, $p < 0.001$) and diabetes distress ($\beta = -0.25$, $p = 0.003$) were independent predictors of poorer physical HRQoL, whereas higher self-care adherence improved HRQoL ($\beta = 0.18$, $p = 0.014$). Age was not a significant factor after adjustment. Physical HRQoL is poorer among older adults with recurrent DFUs, primarily mediated by psychosocial distress.

Conclusion: Our findings demonstrated that psychosocial conditions, especially depression and diabetes-related distress, significantly contribute to poor HRQoL. There is a relationship between depression, distress, and poor quality of life. Moreover, depression and distress independently predicted lower physical QoL, and better self-care is a predictor of QoL. Integrated management addressing psychological well-being and self-care behaviours may enhance the overall patient outcomes.

KEYWORDS:

Diabetic foot ulcer, quality of life, depression, diabetes distress, self-care adherence

INTRODUCTION

Diabetic foot ulcers (DFUs) are a serious complication of diabetes mellitus, often leading to infection, hospitalization, amputation, and even death.^{1,2} Globally, about 19–34% of

people with diabetes will develop DFUs in their lifetime.¹ Even after healing, DFUs tend to recur. Approximately 42% of patients experience recurrence within one year, and up to 65% within five years.¹ DFUs impose a staggering burden, significantly increasing healthcare costs, and are associated with a 5-year mortality rate of 50–70%, rivalling or exceeding that of many cancers.¹ In Indonesia, the incidence of recurrent DFUs is also high, estimated at around 13.30%–33.30% in one year.³ According to data, there is a need for effective prevention and management strategies. Beyond clinical outcomes, DFUs have a profound impact on patients' health-related quality of life (HRQoL). Studies have consistently shown that patients with active or healed DFUs have markedly lower HRQoL than diabetic patients without foot ulcers.^{2,4–7} The chronic wounds, pain, reduced mobility, and threat of amputation associated with DFUs can lead to physical limitations, psychological distress, social isolation, and financial hardship, all of which degrade quality of life (QoL).⁶

The patient's age may play a crucial role in the QoL impact of DFUs. Older adults tend to have more comorbidities, poorer circulation and wound healing, and greater loss of physical function, potentially leading to a worse physical HRQoL.⁶ Younger adults, in contrast, may have better baseline physical function but could experience significant psychological and social consequences from DFUs during their prime working years. International studies have reported mixed findings on age-related differences. For example, a cross-sectional study in Greece found that older patients with DFUs (≥ 60 years) had significantly poorer physical function and energy or fatigue scores than younger patients.² Similarly, a study in Saudi Arabia identified older age (along with female sex, lower education, and income) as a predictor of worse HRQoL in patients with DFUs.⁶ These suggest that older people with DFUs are especially vulnerable to QoL. However, other studies have reported no apparent age-related differences. A recent study in Indonesia reported uniformly low QoL among recurrent DFUs patients and no significant QoL gap between older and younger groups.⁷ Given these discrepancies, further investigation is needed, particularly in the Indonesian context, where the literature is scant.

Apart from age, various physical, psychological, and social factors can influence HRQoL in patients with DFUs. Prior studies indicate that greater disease severity (e.g., larger or

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higher-grade ulcers and more complications) correlates with worse QoL.⁶ However, some findings suggest that wound severity is not always a determinant of QoL.⁷ Metabolic control and diabetes duration have been linked to poor QoL.⁶ Psychosocial factors such as depression and diabetes-related distress are highly prevalent among people with DFUs. Depression affects nearly half of DFUs patients in some reports, and its presence significantly impairs QoL.⁸ Anxiety and low psychological resilience have also been associated with a poor HRQoL.⁶

On the other hand, positive health behaviour and self-care may buffer QoL. Patients who adhere to foot care, diet, and exercise recommendations tend to report better physical and daily functioning.⁹ Social support and socioeconomic status can also impact outcomes, whereas low income or lack of family support might exacerbate stress and reduce access to proper wound care.^{6,8} However, these factors have not been well studied in Indonesian DFUs patients. Most research on diabetic foot has focused on clinical and wound outcomes, with little attention to patient-centered outcomes such as QoL and psychosocial determinants. Therefore, this study aims to evaluate age-related variations in HRQoL and identify factors associated with physical and mental health among patients with recurrent DFUs.

MATERIALS AND METHODS

Study Design and Participants

We conducted a cross-sectional study that adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Setting

Patients with type 2 diabetes mellitus (T2DM) registered at the rural clinic, PKU Muhammadiyah Pontianak, West Kalimantan, Indonesia, between March and September 2025, were recruited for this study.

Study Participants

A total of 316 participants were recruited using a consecutive sampling. The study population included individuals 18 years or older with T2DM. Inclusion criteria were a history of at least one prior DFUs that had healed, followed by a current foot ulcer at the exact location, and the ability to understand and complete the questionnaires (either independently or with minimal assistance). The required sample size was calculated using G*Power software to compare mean HRQoL scores between younger and older adults with recurrent DFUs. The calculation assumed a medium effect size (Cohen's $d = 0.50$) based on previous studies investigating quality of life differences among patients with DFUs. A two-tailed significance level (α) of 0.05, statistical power of 80% ($1 - \beta = 0.80$).¹⁰ To compensate for an anticipated 15% nonresponse or incomplete questionnaire rate. We excluded patients with conditions such as end-stage renal disease, malignancy, severe cognitive impairment or dementia, or primary disabling neurological, critically ill, or those who had undergone emergency amputation. As a result, 245 patients with recurrent DFUs met the inclusion criteria (Figure 1).

Observational Data

We collected data on participants' demographics, clinical characteristics, and QoL through interviews and chart reviews. Demographic data included age, sex, educational level, employment status, and monthly income. Clinical data included duration of diabetes, comorbid conditions (hypertension, heart disease, kidney disease, etc.), diabetes complications, and the number of previous DFUs episodes. We assessed the current characteristics of ulcers using the Wagner classification and infection severity grading,¹¹ which were determined by the wound care specialist. Infection severity was evaluated using the site, ischemia, neuropathy, bacterial infection, and depth (SINBAD) or IDSA criteria (mild, moderate, and severe infection), as documented in the medical records.¹¹⁻¹²

We used two complementary questionnaires to measure HRQoL. Firstly, the Short Form-36 Health Survey (SF-36) assesses eight domains: Physical functioning (PF), role physical (RP) limitations, bodily pain (BP), general health (GH) perceptions, vitality (VT), social functioning (SF), role emotional (RE) limitations, and mental health (MH). Several studies have demonstrated that SF-36 has high validity and reliability.¹³⁻¹⁴ We administered the validated Indonesian version of the SF-36 through interviews.¹⁵ For the analysis, we considered domain scores individually, whereas scores for each domain ranged from 0 to 100. Secondly, we utilized the physical component summary (PCS) and mental component summary (MCS), which are standardized summary measures derived from the SF-36 Health Survey that assess overall physical and mental health-related quality of life, respectively. PCS primarily reflects PF, RP, BP, and GH, whereas MCS primarily reflects MH, RE, SF, and VT. Both summary scores are standardized using norm-based scoring (mean=50, SD=10), with higher scores indicating better health status and quality of life.¹⁶⁻¹⁸

We also used other psychosocial measures. Firstly, the Diabetes Distress Scale-17 (DDS-17) was used to measure diabetes-related emotional distress. This 17-item questionnaire yielded a total distress score (range: 17–102, with higher scores indicating greater distress) and subscale scores for emotional burden, physician-related distress, regimen-related distress, and interpersonal distress. Diabetes distress refers to frustration, worry, and burnout associated explicitly with managing diabetes and its complications.¹⁹ Cronbach's alpha for this scale ranged from 0.78 to 0.83.¹⁹ Secondly, the Beck Depression Inventory II (BDI-II) is a 21-item self-report scale widely used to screen for depression in medical populations. The BDI-II scores range from 0 to 63, with higher scores indicating more severe depressive symptomatology (commonly categorized as minimal, mild, moderate, or severe depression). This scale has been validated in multiple countries, with a Cronbach's alpha ranging from 0.86 to 0.93.²⁰⁻²² The Cronbach's alpha for the Indonesian version of the BDI-II ranged from 0.74 to 0.81.²³ Finally, we measured patient self-care behaviour using the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire. The SDSCA inquired about the frequency of performing various diabetes self-management tasks (such as diet control, blood glucose monitoring, foot hygiene and inspection, and exercise) in the past week.²⁴ This questionnaire has been

widely used in other studies.²⁵⁻²⁷ We used a modified version that focused on foot care and general adherence; for example, patients reported how many days per week they checked their feet, washed their feet, wore appropriate footwear, followed dietary recommendations, and exercised for at least 30 minutes.²⁴ An overall self-care adherence score (0–7 days) was derived by averaging the items, with higher values indicating better adherence to the recommended self-care practices. A study showed that Cronbach's alpha for the Indonesian version of the SDSCA was 0.72.²⁸

Ethical Considerations

The study was approved on March 5, 2025, by the Institute of Technology and Health of Muhammadiyah West Kalimantan Committee (number: 15/II). I.AU/KET.ETIK/III/2025.

Data Analysis

IBM SPSS Statistics (version 22.0) was used for data analysis. First, we performed descriptive statistics to summarize the demographic and clinical characteristics of the data. Continuous data were expressed as mean and standard deviation if normally distributed, or as median and interquartile range if skewed. Categorical data are summarized as frequencies and percentages. We assessed the normality of continuous data with the Kolmogorov-Smirnov test. For bivariate comparisons between the younger and older age groups, we used independent sample t-tests for continuous variables and chi-square tests for categorical variables. To evaluate the associations between potentially related factors and HRQoL, we used Pearson correlation analyses. We examined correlations between HRQoL scores (SF-36 summaries and DFS-SF total score) and key continuous predictors, including age, diabetes duration, DDS-17, BDI-II, and SDSCA self-care scores. In addition, Spearman's rank correlation was used for ordinal or non-normal variables (e.g., Wagner ulcer grade and income level). Finally, we built a multivariable linear regression model to identify the independent factors associated with overall HRQoL. We chose the SF-36 PCS score as the dependent variable for this regression, as our primary interest was in differences in physical quality of life by age, and because the PCS provides a composite of the physical health domains. We included age group (younger vs. older), sex, diabetes duration, number of diabetes complications, DDS-17, BDI-II, and SDSCA score as the initial predictor variables based on theoretical relevance and bivariate results. Using a stepwise backward elimination approach (removing factors with $p > 0.10$ sequentially), we arrived at a final model that retained the significant predictors. We checked assumptions of linearity, normal residuals, and multicollinearity in this regression. A two-sided $p < 0.05$ was considered statistically significant for all analyses. The results are presented with corresponding 95% confidence intervals (CI) or p-values. For subgroup analyses, the patients were stratified into two groups: younger adults (18–59 years) and older adults (≥ 60 years), as categorized by the Indonesian Ministry of Health.

RESULTS

Participant Characteristics

A total of 245 patients with recurrent DFUs were analysed.

Table I presents the demographic and clinical characteristics stratified by age group. Older adult patients had a longer duration of diabetes ($p < 0.001$), had hypertension comorbidity ($p < 0.001$), and had a Wagner grade greater than 3 than younger adult patients ($p = 0.04$). However, younger adult patients were not currently working ($p < 0.001$), and the wound presented with moderate to severe infection compared to older adult patients ($p = 0.003$). There were no differences between the groups in education, low income, number of prior DFUs episodes, SDSCA, DDS-17, BDI-II, and moderate to severe depression score. The following analysis adjusted for these demographic and clinical characteristics.

HRQoL

HRQoL was markedly impaired in both age groups, as expected in the recurrent DFUs population, but older adults showed significantly lower scores on several SF-36 domains. Table II displays that the PCS score was significantly lower in older patients compared to younger patients ($p = 0.002$). In the PF, RP, and GH domains, significant differences were observed due to physical problems ($p < 0.001$, $p = 0.005$, and $p = 0.04$), respectively. However, in contrast to the MCS score, there was no significant difference between younger and older.

Table III, as expected, showed that diabetes-related psychosocial factors had the strongest correlations with QoL. Higher depressive symptom scores were strongly correlated with a worse overall HRQoL. For instance, the BDI-II score had a significant negative correlation with the SF-36 PCS ($r = -0.56$, $p < 0.001$). Similarly, diabetes distress (DDS-17 score) was inversely correlated with HRQoL ($r = -0.42$, $p < 0.001$), as measured by PCS. The SDSCA overall score correlated modestly with the SF-36 PCS ($r = 0.29$, $p < 0.001$). Among the clinical variables, longer diabetes duration was significantly associated with lower SF-36 GH ($r = -0.30$, $p < 0.001$). Ulcer severity showed a weak negative correlation with SF-36 PF ($r = -0.15$, $p = 0.02$). Age was correlated with lower SF-36 PF ($r = -0.26$, $p < 0.001$), but not significantly with MH or DFS-SF scores, reinforcing that age is primarily linked to physical aspects of QoL.

Independently associated factor of HRQoL in younger and older adults

Table IV shows that the BDI-II depression score emerged as the strongest independently associated factor with worse PCS (standardized $\beta = -0.48$, $p < 0.001$). Diabetes distress was the next most significant independently associated factor ($\beta = 0.25$, $p = 0.003$), indicating that emotional distress specific to diabetes also independently contributed to poorer physical QoL. Self-care adherence had a positive, independent effect ($\beta = 0.18$, $p = 0.014$), indicating that better self-care was associated with higher PCS scores after controlling for mood factors and demographics. Notably, age group (older vs. younger) was not a significant predictor of PCS in the multivariate model ($p = 0.27$) once depression, distress, and self-care were considered. This implies that the bivariate age differences in physical QoL observed earlier may be primarily explained by the higher burden of psychosocial issues and longer disease duration in older patients rather than age. Consistent with this, adding diabetes duration to the model (which was correlated with age) attenuated the age effect. In

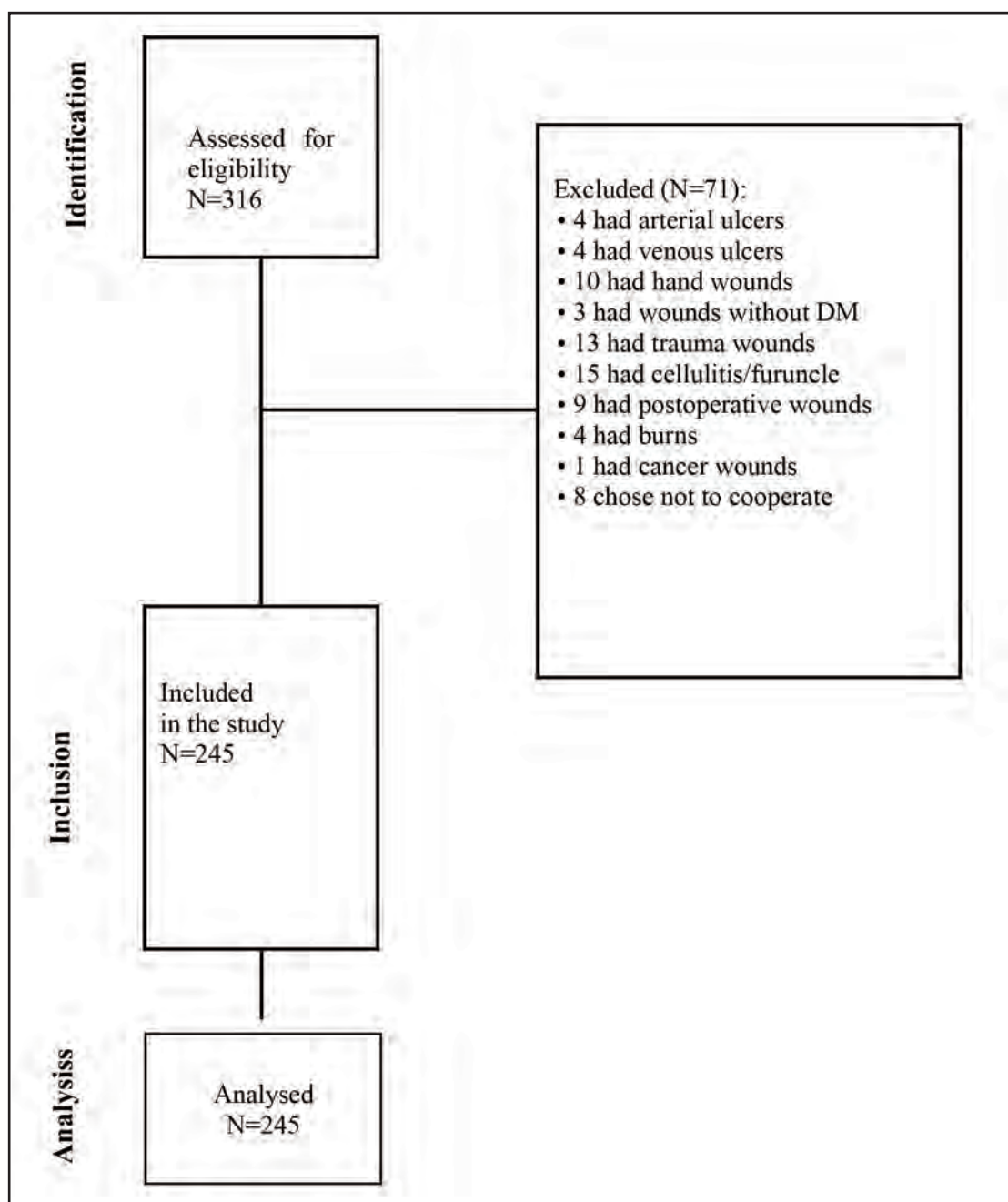


Fig. 1: Strengthening the reporting of observational studies in epidemiology: flow chart of the participant enrolment process

the final model, diabetes duration itself was not significant ($p=0.12$), nor was the comorbidity count or ulcer severity (these variables were removed in the stepwise elimination process due to $p>0.2$). Although diabetes complications and ulcer severity demonstrated significant associations with physical HRQoL in the univariate analyses, these associations were attenuated after adjustment for depression, diabetes distress, self-care adherence, age, and diabetes duration. Consequently, they did not remain independently associated factors in the final multivariable model and were excluded during the backward stepwise selection procedure.

The model explained approximately 42% of the variance in PCS (adjusted $R^2=0.42$, $F=36.8$, $p<0.001$).

DISCUSSION

To the best of our knowledge, this is the first study of Indonesian patients with recurrent DFUs to compare patients across different age groups. In this study, we found that depression and distress scores, both in adult younger and adult older, were independently associated with lower physical QoL. Our study found that older patients had a

Table I: Demographic and clinical characteristics of participants by age group (n=245)

Characteristics	Total (N=245)	Younger Adults (18–59 yrs, n=150)	Older Adults (≥60 yrs, n=95)	p-value (Younger vs Older)
Age, mean (SD), years	57.4 (10.2)	50.8 (6.7)	67.4 (5.3)	< 0.001**
Male sex, n (%)	152 (62.0%)	90 (60.0%)	62 (65.3%)	0.40
Duration of diabetes, mean (SD), yrs	10.9 (8.2)	8.6 (6.5)	14.2 (9.1)	< 0.001**
≥1 Diabetes complications (cardiovascular disease or nephropathy), n (%)	146 (59.6%)	68 (45.3%)	78 (82.1%)	< 0.001**
Hypertension comorbidity, n (%)	142 (58.0%)	72 (48.0%)	70 (73.7%)	< 0.001**
Education: ≥College, n (%)	52 (21.2%)	52 (21.3%)	20 (21.1%)	0.98
Low income (<minimum wage=IDR 3.024.820), n (%)	133 (54.3%)	81 (54.0%)	52 (54.7%)	0.90
Currently not working, n (%)	198 (80.8%)	110 (73.3%)	88 (92.6%)	< 0.001**
Number of prior DFU episodes, median [range]	1 [1–3]	1 [1–3]	1 [1–3]	0.72
Wagner ulcer grade ≥ 3, n (%)	75 (30.6%)	36 (24.0%)	39 (41.1%)	0.04 *
Moderate/severe infection, n (%)	112 (45.7%)	57 (38.0%)	55 (57.9%)	0.003**
SDSCA self-care score (0–7), mean (SD)	4.2 (1.5)	4.3 (1.5)	4.0 (1.6)	0.09
DDS-17 diabetes distress, mean (SD)	40.2 (12.5)	39.0 (12.0)	42.1 (13.1)	0.08
BDI-II depression score, mean (SD)	18.0 (11.3)	17.5 (10.8)	18.8 (12.0)	0.36
Moderate-to-severe depression (BDI ≥20), n (%)	53 (21.6%)	27 (18.0%)	26 (27.4%)	0.10

Values are mean (SD) or n (%) unless otherwise indicated, p-values by independent t-test for means, or chi-square test for proportions (except DFU episodes by Mann–Whitney U test). Statistical significance was set at $p < 0.05$. Abbreviations: SD = standard deviation; DFU = diabetic foot ulcer; SDSCA = Summary of Diabetes Self-Care Activities (weekly frequency of recommended behaviors); DDS-17 = 17-item Diabetes Distress Scale; BDI-II = Beck Depression Inventory-II. Significance: $p < 0.05$, marked with*; $p < 0.01$, marked with**.

Table II: SF-36 Health-related quality of life domain scores by age group (n=245)

SF-36 Domain	Younger (18–59 yrs) Mean (SD)	Older (≥60 yrs) Mean (SD)	p-value
Physical Functioning (PF)	64.3 (21.5)	52.0 (22.7)	< 0.001**
Role Physical (RP)	35.3 (41.0)	21.8 (35.7)	0.005**
Bodily Pain (BP)	50.9 (24.6)	51.2 (25.4)	0.95
General Health (GH)	50.2 (19.8)	44.5 (17.6)	0.04 *
Vitality (Energy) (VT)	53.5 (20.4)	47.0 (21.9)	0.06
Social Functioning (SF)	52.1 (23.3)	48.3 (24.5)	0.30
Role Emotional (RE)	37.8 (44.0)	34.1 (45.3)	0.58
Mental Health (MH)	60.8 (18.9)	59.4 (19.5)	0.67
Physical Component Summary (PCS)	38.0 (9.5)	34.1 (8.9)	0.002**
Mental Component Summary (MCS)	40.8 (11.7)	41.1 (12.4)	0.88

The SF-36 domain scores ranged from 0 (worst) to 100 (best). Higher scores indicate a better health status in that domain. PCS and MCS are composite scores normalized to a population mean of ~50 (SD = 10). Significant differences (independent t-tests) are shown in bold font. Older adults had significantly lower scores in the physical domains (PF, RP, GH) and PCS, whereas no significant age differences were observed in the mental and social domains.

Table III: Correlation of Selected Factors with Health-Related Quality of Life Measures

Predictor Variables	SF-36 PCS (Physical Component)	SF-36 MCS (Mental Component)
Age (years)	−0.26 **	−0.04
Diabetes duration (years)	−0.33 **	−0.08
No. of diabetes complications	−0.28 **	−0.10
Wagner ulcer grade	−0.15 *	−0.05
SDSCA self-care score	+0.29 **	+0.14 *
DDS-17 diabetes distress score	−0.42 **	−0.37 **
BDI-II depression score	−0.56 **	−0.45 **
Age group (older=1, younger=0)	−0.22 **	−0.01

Values are Pearson's correlation coefficient (r). $p < 0.05 = *$; $p < 0.01 = **$. A positive r indicates that a higher predictor is associated with a higher (better) QoL score, and a negative r indicates that a higher predictor is associated with a worse QoL. For the categorical "Age group," point-biserial correlation is shown. The BDI-II and DDS-17 showed strong negative correlations with both generic and ulcer-specific QoL.

Table IV: Multivariate linear regression predicting physical HRQoL (SF-36 PCS)

Predictor (Independent Variable)	Unstandardized B (SE)	Standardized β	t value	p-value
BDI-II Depression score (per 10 pts)	-3.21 (0.50)	-0.48	-6.43	<0.001**
DDS-17 Distress score (per 10 pts)	-1.45 (0.47)	-0.25	-3.05	0.003**
SDSCA Self-care (per 1 day increase)	+0.98 (0.39)	+0.18	+2.49	0.014*
Age group (Older vs Younger)	-1.18 (1.06)	-0.06	-1.10	0.27
Diabetes duration (years)	-0.08 (0.05)	-0.10	-1.57	0.12

The dependent variable was the SF-36 Physical Component Summary (PCS) score. The table shows the final model after the stepwise selection. B (SE) = unstandardized coefficient with standard error. Sex, number of complications, and ulcer severity were not included in the final model ($p > 0.10$). Higher depression and distress scores independently predicted lower physical QoL, whereas better self-care predicted a higher QoL. Age and diabetes duration were not significant after controlling for other factors.

lower PCS score than younger patients. Our findings are similar to those of Sari et al., although our study included patients with recurrent DFUs.²⁹ The PCS score is lower, which may be because in Indonesia, older adults experience a decrease in physical and role function following a wound. Thus, a program to increase PCS not only in diabetic older adults but also in patients with DFUs, particularly those with recurrent disease.

Interestingly, in the present study, there was no difference in the MCS of younger and older adult patients. The result is similar to those of Sari et al.²⁹ This can be explained by the fact that all participants experienced depression and distress. Depression and distress are likely attributable to the prolonged duration of diabetes mellitus, diabetes complications, Hypertension comorbidity, Wagner ulcer grade, and infection.

Our study found a negative correlation between PCS and age, diabetes duration, diabetes complications, Wagner ulcer grade, DDS, and BDI in both younger and older adult patients. Interestingly, DDS and BDI have a high correlation with physical decline, resulting in poor quality of life in people with DFUs, older and younger. These results are in line with previous research, which stated that depression causes a decrease in QoL.³⁰ Meanwhile, the wound healing process will be disrupted due to stress, anxiety, and depression.³¹ We also found a negative correlation between MCS with DDS and BDI. This is in line with the results of previous studies that reported that there was a negative association between MCS and depression and depression in people with chronic illnesses.³² Therefore, the intervention approach carried out for management in DFUs sufferers is not only physical but also mental or psychological. Additionally, a positive correlation was found between PCS, MCS, and SDSCA. This finding is consistent with previous studies showing that poor diet management (a component of the SDSCA) is associated with lower MCS.³³ However, in other studies, it was reported that there was no association between SDSCA and PCS.¹⁷ This difference may be due to differences in the characteristics of sufferers and Indonesian culture.

In the present study, we found depression and distress were independently associated with lower physical QoL. These results are similar to previous studies that depression and anxiety are independently associated factors of poor QoL.³⁴⁻³⁶ Moreover, our findings show that better self-care is a predictor of QoL.³⁷ Although the sample in this study was of patients with heart failure, we assumed that the condition

and response of heart failure disease and DFUs were the same as those of chronic diseases.

Although diabetes complications and ulcer severity were significantly associated with poorer physical quality of life in the univariate analyses, they were not retained in the final multivariable model. This finding suggests that their apparent effects may be partly mediated or shared with psychosocial factors, particularly depression and diabetes-related distress, which demonstrated stronger independent associations with HRQoL. In patients with recurrent DFUs, psychological burden may represent a more proximal determinant of perceived QoL than clinical severity alone.

Clinical and Public Health Implications

Our findings provide a comprehensive approach for managing DFUs. Multidisciplinary foot care teams should ideally include not only podiatrists and wound care specialists, but also diabetes educators, mental health professionals, and social workers.

LIMITATIONS

This study had several limitations. Firstly, the cross-sectional design does not allow researchers to determine a causal relationship between depression and HRQoL. Although depression was found to be significantly associated with lower QoL, the direction of this relationship remains uncertain. While depression may contribute to decreased QoL, poor QoL due to complications of DFUs may also increase depressive symptoms. Therefore, longitudinal studies are needed to clarify this causal relationship. Secondly, although several important demographic and clinical variables were included in the analysis, residual confounding remains possible. Factors such as ulcer duration, wound severity progression, pain intensity, glycemic variability, treatment adherence, and psychosocial support were not measured and may have influenced HRQoL outcomes. Consequently, the findings should be interpreted with caution, and future studies should include these variables to further elucidate their contribution to QoL outcomes. Lastly, our sample was drawn from a single center, which might limit the generalizability of our results. Additionally, our study focused on patients with recurrent ulcers; thus, the findings might differ from those of patients with first-time ulcers or more acute cases. Recurrent DFUs patients likely have more experience and potentially different coping mechanisms, which could affect their reporting of QoL.

CONCLUSION

This study provides evidence that psychosocial well-being and self-care should be considered as important components in the comprehensive management of diabetic foot. These findings indicate that improving only QoL for patients with recurrent DFUs is not just about wound care but also about psychological screening, diabetes self-management support, and multidisciplinary care. The integration of these components into clinical practice can contribute to more patient-centered care and better long-term outcomes. Future longitudinal and intervention studies are needed to establish causal relationships and evaluate the effectiveness of integrated management strategies.

REFERENCES

- McDermott K, Fang M, Boulton AJM, Selvin E, Hicks CW. Etiology, epidemiology, and disparities in the burden of diabetic foot ulcers. *Diab Care* 2023; 46: 209-11.
- Polikandrioti M, Vasilopoulos G, Koutelekos I, Panoutsopoulos G, Gerogianni G, Babatsikou F, et al. Quality of life in diabetic foot ulcer: associated factors and the impact of anxiety/depression and adherence to self-care. *Int J Low Extrem Wounds* 2020; 19: 165-79.
- Suriadi, Pratama K, Fahrain J, Junaidi, Herman, Pradika J, et al. Prevention strategy for ulcer recurrence in patients with type ii diabetes mellitus: a quasi-experimental study. *Iran J Nurs Midwifery Res* 2023; 28: 139-43.
- Byrnes J, Ward L, Jensen S, Sagoo M, Charles D, Mann R, et al. Health-related quality of life in people with different diabetes-related foot ulcer health states: a cross-sectional study of healed, non-infected, infected, hospitalised and amputated ulcer states. *Diabetes Res Clin Pract* 2024; 207: 1-7.
- Khunkaew S, Fernandez R, Sim J. Health-related quality of life and self-care management among people with diabetic foot ulcers in Northern Thailand. *SAGE Open Nurs* 2019; 1-10.
- Kuang D, Gu DF, Cao H, Yuan QF, Dong ZX, Yu D, et al. Impacts of psychological resilience on self-efficacy and quality of life in patients with diabetic foot ulcers: a prospective crosssectional study. *Ann Palliat Med* 2021; 10: 5610-8.
- Haryanto H, Makmuriana L, Hartono H, Arini DD, Ariyanti S, Sari Y, et al. Quality of life in patients with recurrent diabetic foot ulcers. *Cent Eur J Nurs Midwifery* 2023; 14: 833-8.
- Costa D, Ielapi N, Caprino F, Giannotta N, Sisinni A, Abramo A, et al. Social aspects of diabetic foot: a scoping review. *Social sci* 2022; 11: 2-24.
- Paixão LO, Zanchetta FC, Pereira J de A, Kaizer UAO, Bramante CM, Apolinario PP, et al. Factors associations and with health-related quality of life in individuals with diabetic foot ulcers: cross-sectional study. *J Wound Manag* 2025; 26: 22-8.
- Serdar CC, Cihan M, Yücel D, Serdar MA. Sample size, power and effect size revisited: Simplified and practical approaches pre-clinical, clinical and laboratory studies. *Biochem Med* 2021; 31: 1-27.
- Leese GP, Soto-Pedre E, Schofield C. Independent observational analysis of ulcer outcomes for SINBAD and University of Texas ulcer scoring systems. *Diab Care* 2021; 44: 326-31.
- Senneville É, Albalawi ZAS, Asten V, Abbas ZG, Geneve A. Guidelines on the diagnosis and treatment of foot infection in persons with diabetes: IWGDF/IDSA. The International Working Group on the Diabetic Foot 2023.
- Tapp RJ, Dunstan DW, Phillips P, Tonkin A, Zimmet PZ, Shaw JE. Association between impaired glucose metabolism and quality of life: Results from the Australian diabetes obesity and lifestyle study. *Diabetes Res Clin Pract* 2006; 74: 154-61.
- Brazier JE, Harper R, Jones NMB, O'Cathain A, Thomas KJ, Usherwood T, et al. Validating the SF-36 health survey questionnaire: New outcome measure for primary care. *Br Med J* 1992; 305: 160-4.
- Salim S, Yamin M, Alwi I, Setiati S. Validity and reliability of the Indonesian version of SF-36 quality of life questionnaire on patients with permanent pacemakers. *Acta Med Indones* 2017; 49: 10-6.
- Jhon E. Ware J. SF-36 physical and mental health summary scales: A user's manual. Boston: Health Assessment Lab, New England Medical Center; 1994.
- Iudici M, Cuomo G, Vettori S, Avellino M, Valentini G. Quality of life as measured by the short-form 36 (SF-36) questionnaire in patients with early systemic sclerosis and undifferentiated connective tissue disease. *Health Qual Life Outcomes* 2013; 11: 2-6.
- Pfah ER, Chan KS, Dinglas VD, Cuthbertson BH, Elliott D, Porter R, et al. The SF-36 offers a strong measure of mental health symptoms in survivors of acute respiratory failure: a tri-national analysis. *Ann Am Thorac Soc* 2016; 13: 1343-50.
- Arifin B, Perwitasari DA, Thobari JA, Cao Q, Krabbe PFM, Postma MJ. translation, revision, and validation of the diabetes distress scale for Indonesian Type 2 diabetic outpatients with various types of complications. *Value Health Reg Issues* 2017; 12: 63-73.
- Segal DL, Coolidge FL, Cahill BS, O'Riley AA. Psychometric properties of the beck depression inventory-II (BDI-II) among community-dwelling older adults. *Behav Modif* 2008; 32: 3-20.
- Kojima M, Furukawa TA, Takahashi H, Kawai M, Nagaya T, Tokudome S. Cross-cultural validation of the Beck Depression Inventory-II in Japan. *Psychiatry Res* 2002; 110: 291-9.
- Gomes-Oliveira MH, Gorenstein C, Neto FL, Andrade LH, Wang YP. Validação da versão Brasileira em Português do inventário de depressão de beck-ii numa amostra da comunidade. *Revista Brasileira de Psiquiatria* 2012; 34: 389-94.
- Ginting H, Näring G, Van Der Veld WM, Srisayekti W, Becker ES. Validating the beck depression inventory-II in Indonesia's general population and coronary heart disease patients. *Int J Clin and Health Psychol* 2013; 13: 235-42.
- Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. *Diab Care* 2000; 23: 943-50.
- Kamradt M, Bozorgmehr K, Krisam J, Freund T, Kiel M, Qreini M, et al. Assessing self-management in patients with diabetes mellitus type 2 in Germany: validation of a German version of the Summary of Diabetes Self-Care Activities measure (SDSCA-G). *Health Qual Life Outcomes* 2014; 12: 1-10.
- Choi EJ, Nam M, Kim SH, Park CG, Toobert DJ, Yoo JS, et al. Psychometric properties of a Korean version of the summary of diabetes self-care activities measure. *Int J Nurs Stud* 2011; 48: 333-7.
- Gurmu Y, Gela D, Aga F. Factors associated with self-care practice among adult diabetes patients in West Shoa Zone, Oromia Regional State, Ethiopia. *BMC Health Serv Res* 2018; 18: 4-11.
- Sugiharto, Hsu YY, Toobert DJ, Wang ST. The Validity and Reliability of the summary of diabetes self-care activities questionnaire: An Indonesian version. *Ind Nurs J Educ and Clin*. 2019; 4: 25.
- Sari Y, Isworo A, Upoyo AS, Taufik A, Setiyani R, Swasti KG, et al. The differences in health related quality of life between younger and older adults and its associated factors in patients with type 2 diabetes mellitus in Indonesia. *Health Qual Life Outcomes*. 2021; 1-10.
- Alwhaibi M. Depression, anxiety, and health-related quality of life in adults with type 2 diabetes. *J Clin Med* 2024; 13: 1-10.
- Alasfour L, Alboloushi A, Kirwan E, McIntosh C, MacGilchrist C, Hurst JE. Mapping the evidence to determine the influence of stress, anxiety, and depression on wound healing in patients with diabetes-related foot ulcers: a scoping review. *J Tissue Viability*. 2025; 34: 1-8.

32. Aburuz ME. Anxiety and depression predicted quality of life among patients with heart failure. *J Multidiscip Healthc* 2018 11: 367-73.
33. Dalal J, Williams JS, Walker RJ, Campbell JA, Davis KS, Egede LE. Association between dissatisfaction with care and diabetes self-care behaviors, glycemic management, and quality of life of adults with type 2 diabetes mellitus. *Diab Educ* 2020; 46: 370-7.
34. Mashayekhi Y, Baba-Aissa S, Assefa AK, Mutamba FT, Nur AM, Shahid ZY, et al. Depression and Anxiety as Predictors of Quality of Life in Osteoarthritis Patients. *Cureus* 2025; 1-16.
35. Cakmak S, Gen E. Relationship between quality of life, depression and anxiety in type 1 and type 2 diabetes. *J Psychi and Neuro Scienc* 2020; 33: 155-69.
36. Moghadam FD, Rahami Z, Ahmadi SA, Reisi S, Ahmadi SM. Predicting quality of life and self-care behaviors in patients with painful diabetic neuropathy based on psychological factors. *Sci Rep* 2025; 15: 1-8.
37. Tapak L, Amini P, Parami S, Hamidi O, Ramezani-Doroh V, Azizi A. Investigating the correlation of self-care and quality-of-life patients with heart failure. *BMC Cardiovasc Disord* 2025; 25: 1-15.