Impact of chronic wound on quality of life among diabetic foot ulcer patients in a selected hospital of Guwahati, Assam, India

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Abstract

Background: Diabetic foot ulcer (DFU) is an important mortality factor among diabetes mellitus (DM) patients and has a massive impact on the quality of life (QoL) of patients. The non-heal foot ulcer needs extra care and need special attention in maintaining wound hygiene. Dressing on wound is done in four stages such as cleanse the wound, debridement of wound, fashioning of edges and final dressing. The important stage of cleanse the wound was done with solution extracted from neem leaves which has medicinal value and anti-biotic properties and was used instead of normal saline or water solution, which do not carry medicinal value. Other medicinal solutions are of high cost as well as not easily available such as octanedione dihydrochloride or hypochlorous acid etc. **Aims:** This study was aimed to investigate the impact of DFU on QoL among patients suffering from chronic wounds. **Materials and methods:** A cross-sectional, descriptive study was conducted at foot care clinic in a private hospital situated at Guwahati, Assam. Data were collected using a pro forma consisting of sociodemographic variables, Wagner ulcer classification and Cardiff wound impact questionnaire. Analysis of data was done using the descriptive and inferential statistical methods. **Results:** A total of 118 DFU patients of type 1 and 2 DM were studied. Out of which, 81.4% were male and 18.6% were female. About 66 participants (55.9%) were in grade 2 and 38 (32.2%) were in grade 3 of Wagner ulcer classification. Overall mean score for QoL was 6.27, whereas overall mean score for satisfaction on QoL was 7.01. Patients had the highest score in the well-being domain and lowest in the social life stress. Computation of correlation matrix and factor analysis showed a positive correlation between QoL and satisfaction and negative correlation between QoL and satisfaction with stressful experience of social life and physical symptoms experience ($P < 0.05$, 0.01). Multiple regression analysis reveals that satisfaction had a significant impact on QoL ($P < 0.001$) with $r^2 = 62.59\%$. Factor analysis of correlation matrix showed that physical symptoms and daily living experiences and social experiences as well as stress dominated factor 1 followed by satisfaction led QoL in factor 2 and social life stress was the leading force in factor 3. **Conclusion:** QoL of patients with DFUs can be improved by educating the diabetic patients on the prevention and early detection of foot ulcers, other diabetic complications, and availing benefits of prevailing health-care facility in early stages.

Keywords: Diabetic foot ulcer, impact of wound, quality of life

Introduction

Diabetes is a major health issue that has reached alarming levels and today, nearly half a billion people are living with diabetes worldwide.[1] Diabetic foot ulcer (DFU) is a disabling long-term complication of diabetes mellitus (DM), caused by the presence of neuropathy, angiopathy, and foot deformity.[2] Foot ulcer problems are the common complications of diabetes and are associated with the various levels of amputation rate and life-threatening complications. Approximately 15% of diabetes patients experience a foot ulcer and about 14%–24% of those with foot ulcer require amputation.[3] Around 20% of hospital admissions of DM patients are for treatment of DFUs as they can lead to infection, amputations, and even death if neglected.[4]

Foot complications have an enormous impact on the quality of life (QoL) of patients with DMs, and the financial cost is considerable.[5] All domains of life such as physical, psychological, social, and economic can be affected. The degree of disruption is proportional to the severity of complication.[6]

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Reduction of QoL in patients not only affects the outcome of treatment but also increases health-care expenditures due to frequent referring to clinical care settings.[7] The aim of the present study was to examine the impact of foot ulcers on the different components of patients' QoL and determine its associated factors among patients with DFUs in a selected hospital of Guwahati, Assam, India. The objective were to examine the relationships between QoL and the selected sociodemographic characteristics like age, gender, income and level of education and to study the impact of foot ulcer on various domains of daily life.

Materials and methods

Study design

A cross-sectional, descriptive study was conducted among 118 patients with DFUs who attended the foot clinic at a private hospital in India. Pilot study was conducted on 10 patients for testing the feasibility of conducting the study.

Inclusion criteria

Patients who met the inclusion criteria irrespective of gender, religion were invited to participate in the study after obtaining informed consent.

- Foot ulcer patients whose age was 18 years and above were included in the study
- Diabetic patients having a foot ulcer of minimum 1 cm square area
- Foot ulcers of grades 1, 2, 3 as per Wagner scale.

Exclusion criteria

- Patients with ulcer grade of 5 were excluded
- Patients with a history of stroke, cancer or mental retardation, systemic infections, or on immune-compromised treatments were excluded.

Data collection

The data were collected during the period March 1 to December 31, 2019. A structured questionnaire was used to collect the data on sociodemographic information and clinical characteristics of patients. Cardiff wound impact questionnaire was used to collect the data on overall QoL and the effect of wound on daily life of the patients. Other relevant data such as the presence of diabetes complications, comorbidity, and biomedical data were obtained from the medical records of the participants available in the hospital.

Cardiff wound impact (CWI) questionnaire scale

The questionnaire is a descriptive system, which provides a comprehensive measurement of the impact of DFUs on patients QoL and on the daily life. The questionnaire consists of 47 items comprising seven subscales. The seven domains are overall QoL (graded on a 10-point scale), satisfaction with QoL (graded on a 10-point scale), stressful social life experience (7 items, maximum score-35), social life experience (7 items, maximum score-35), well-being (7 items, maximum score-35), physical symptoms and daily living experience (12 items, maximum score-60) and stressful physical symptoms and daily living experience (12 items, maximum score-60).

Permission from the author was obtained for using the questionnaire. Both forwarded and back translation was done for using the tool in the local language (Assamese). The tool was pilot tested for validity and reliability, and necessary modifications were done. The questionnaire's subscale scores were computed based on the scoring guidelines given. Items were aggregated from each component/subscale with total scores being 245, with no cutoff value.

Assessment and measurements

Ulcer assessment included ulcer site, ulcer duration (age of the wound), and ulcer classification grades 1, 2, 3, 4 or 5 according to the Wagner classification[8] was done. Blood pressure of patients was measured using the standard equipment. High blood pressure was labeled when patient's systolic blood pressure was ≥130 mmHg or diastolic blood pressure ≥80 mmHg or if the patient was diagnosed with hypertension on antihypertensive drugs. Random blood sugar level and hemoglobin A1c (HbA1c) was measured. Diabetes was considered to be controlled if the patient had HbA1c <7.0% according to the American Diabetes Association 2019 guidelines.[9] Vibration sensation was assessed using Tuning fork 128 Hz to determine neuropathy of the foot. Lower limb ischemia was defined as absent posterior tibial artery pulses with or without symptoms and signs of peripheral vascular disease (PVD) or absent dorsalis pedis pulses with at least one symptom or sign indicating PVD. These symptoms and signs include intermittent claudication, edema and change in the color of the skin. Foot wear assessment was done for the fitness and shape. Patients were assessed for the presence of previous diabetes-related amputation.

Data analysis

Descriptive and inferential statistics were used to analyze the data using the SPSS software. Means standard deviation (SD) and frequency distribution were used. One-way analysis of variance (ANOVA) was used to analyze the differences among the group means. Multivariate ANOVA was used to examine the net effect for each of the independent variable on QoL scales and subscales; $P \leq 0.05$ is considered significant.

Ethical considerations

The study was approved by the ethics committee of Marwari Hospital, registered with CDSCO, Government of India and registration No. ECR/487/Inst/AS/2013/RR-16 and performed in accordance with the principles of good clinical practice.

Results

Participants' characteristics

A total of 118 participants, aged between 23 years and 80 years with a mean age (SD) of 55.22 (11.24) were included in the study. The sociodemographic and clinical characteristics of the study participants are presented in Table 1.

Impact of wound and quality of life

The overall average score of QoL was 6.27 (1.87) and satisfaction with QoL was 7.01 (1.74). Mean (SD) scores of the subscales on the CWI questionnaire were calculated and are presented in Table 2. The mean scores were 24.83 (3.87)

Table 1: Socio-demographic and clinical characteristics of the study participants (*n*=118)

Demographic variables	Frequency, *n* (%)
Age (years)	
21-40	6 (5.1)
41-60	76 (64.4)
61-80	36 (30.5)
Sex	
Male	96 (81.4)
Female	22 (18.6)
Marital status	
Single	2 (3.7)
Married	116 (98.3)
Education	
Illiterate	4 (3.4)
Lower primary	5 (4.2)
Upper primary	6 (5.1)
High school	27 (22.9)
Higher secondary	45 (38.1)
Graduate	27 (22.9)
Postgraduate	4 (3.4)
Income (Rs.)	
1000-25,000	68 (57.6)
25,001-50,000	26 (22)
50,001-75,000	20 (16.9)
75,001-100,000	4 (3.5)
Ulcer grade	
1	9 (7.6)
2	66 (55.9)
3	38 (32.2)
4	5 (4.2%)
Medication	
OHA	22 (18.6)
Insulin	83 (70.3)
Insulin and OHA	13 (11.1)
HbA1C	
≤10	69 (58.47)
≥10	49 (41.53)

OHA: Oral hypoglycemic agents, HbA1C: Hemoglobin A1c

for the subscale "well-being," 11.35 (7.66) for "social life stress," 20.07 (5.17) for "social life experiences," 37.94 (5.70) for "physical symptoms and daily living experience," and 24.13 (6.11) for physical symptoms and daily living experience stress." The lowest percentage of scores (32.4%) was seen in the social life stress domain, the highest scores of percentages were seen in the "well-being" domain.

Correlation of variables

Correlation analysis was done to study the possible relationship between age of wound, income with QoL, satisfaction, and other experiences of daily living, as shown in Table 3.

Correlation half matrix was computed to analyze the factors correlated with the QoL scales. Highlighted cells in the figure [Table 4] show that there is a positive correlation between QoL and satisfaction, social life stress and social life experience and physical symptoms experience ($P < 0.05$, 0.01). Bold volumes in cells in the figure [Table 4] explain the negative correlation between QoL and satisfaction with stressful experience of social life and physical symptoms experience. ($P < 0.05$, 0.01). Multiple regression analysis reveals that of satisfaction had a significant impact on QoL ($P < 0.001$), while income, social life stress, social life experience, wellbeing, physical symptoms and daily living experience, and physical symptoms and daily living stress had insignificant impact. It explained 62.59% of total variability in QoL.

Factor analysis of correlation matrix by the principal component method followed by Varimax rotation [Table 4] found that three factors altogether explained 61.86% of total variability in data. At individual level, symptomatic living and social experiences and stress dominated (Factor 1) by 35.17% while satisfaction led QoL (Factor 2) that accounted for 14.94% of variability while social life stress was a leading force (Factor 3) which accounted for 11.74%.

Discussion

Diabetes is a systemic disease with serious lower extremities manifestations including DFU(s) and diabetic foot infection that lead to substantial patient morbidity and mortality. The etiology of diabetic foot disease is multifactorial and includes complications of diabetic neuropathy, vasculopathy, immunopathy, and poor glycemic control. The present study

Table 2: Quality of life and impact of wound on various domains among study participants (*n*=118)

Domains	Minimum score	Maximum score	Sum	Percentage	Mean	SD
Overall QoL	0	10	740	62.7	6.2712	1.879
Satisfaction	0	10	827	70.1	7.012	1.742
Social life stress	7	35	1339	32.4	11.35	7.658
-Social life experience	7	35	2368	57.3	20.07	5.172
Well-being	7	35	2930	70.9	24.83	3.875
Physical symptoms and daily living experience	12	60	4477	63.2	37.94	5.701
Physical symptoms and daily living stress	12	60	2847	40.2	24.13	6.114

QoL: Quality of life, SD: Standard deviation

Table 3: Correlation, atrix of participant's variables

Parameters	Income (Rs.)	QOL	Satisfaction	Social life stress	Social life experience	Well-being	Physical symptoms and daily living stress
Age of wound	−0.024 (0.793)	0.039 (0.676)	0.028 (0.764)	−0.071 (0.447)	<0.001 (0.999)	0.004 (0.968)	−0.039 (0.677)
Income (Rs.)		0.075 (0.421)	0.137 (0.14)	0.002 (0.982)	−0.227* (0.013)	−0.172 (0.062)	−0.202* (0.028)
QoL			0.725** (<0.001)	−0.178 (0.057)	−0.254** (0.006)	−0.131 (0.161)	−0.261** (0.005)
Satisfaction				−0.249** (0.007)	−0.287** (0.002)	−0.228* (0.013)	−0.366** (<0.001)
Social life stress					0.331** (<0.001)	0.183* (0.047)	0.270** (0.003)
Social life experience						0.483** (<0.001)	0.565** (<0.001)
Well-being							0.374** (<0.001)
Physical symptoms and daily living experience							0.680** (<0.001)

Figure within parenthesis indicates *P*. *Correlation is significant at the 0.05 level (2 tailed). **Correlation is significant at the 0.01 level (2 tailed)

Table 4: Rotated factor matrix (varimax rotation)

	Factor 1	Factor 2	Factor 3
Age of wound	−0.056	0.017	−0.796
Income (Rs.)	−0.260	0.084	0.485
QOL	−0.200	0.751	−0.010
Satisfaction	−0.208	0.978	−0.017
Social life stress	0.319	−0.187	0.435
Social life experience	0.701	−0.144	0.007
Well-being	0.480	−0.131	−0.070
Physical symptoms and daily living experience	0.796	−0.091	0.099
Physical symptoms and daily living stress	0.793	−0.205	0.059
Initial Eigen values/total variance	3.17	1.34	1.06
Percentage of variance	35.17	14.94	11.74
Cumulative (%)	35.17	50.11	61.86

QOL: Quality of life

aimed to investigate the impact of DFUs on the different components of patient's QoL and determine its associated factors. In the current study, most of the participants were aged <70 years old (*n* = 97).

Participant's mean age was 55 years, whereas a maximum number of participants (*n* = 76) belonged to the age group of 41–60 years. When compared to a study by Ribu *et al*. (2006), it has been found that patients with DFUs had a mean age of 60.8 (SD = 13.8). Although this study did not specifically focus on older population, literature shows that DFUs increase with age. Among the participants, majority were males (*n* = 96), whereas females were less (*n* = 22) which indicates foot ulcers are more common in males contributing to the fact that males are more involved in outdoor activities when compared to females, resulting in injury to the foot. More than two-thirds of the participants (*n* = 83) were on insulin therapy, indicating that patients had poor metabolic control and about half of participants (*n* = 69) had higher levels of HbA1c (≥10%).

Successful healing of DFUs often requires the long periods of treatment with additional limitations in patients' daily activities. This burden in the life of patients adversely affects health-related QoL (HRQOL)[10] and well-being which encompasses psychological, physical, spiritual, and cultural domains.[11] The psychological impact of living with a chronic wound is suggested to be of equal importance and interrelated with the physical symptoms.[9] Recent United State and United Kingdom studies showed that DFUs adversely affect the QoL of patients.[12,13] The present study reported that female DFU patients had a mean QoL score of 6, whereas males had a mean score of 6.3. The present study revealed a significant correlation (positive) between satisfaction and QoL at *P* < 0.01 level of significance. Women are likely to be more concerned as caring of children in addition to care about her health conditions and their impact on family environment than men, particularly as homemakers. In agreement with our finding, most previous studies had shown that males had better QoL than females.

DFU patients have limited ability to perform the activities of daily living resulting in various psychological effects and losing one's self esteem. In this study, three factors were extracted [Table 4] .The first factor might be called patients experience as physical symptoms experience and social life experience load highly on it. Second factor might be called standard of quality as quality of life and satisfaction with quality-of-life load highly on it. The third factor might be called economic wellbeing as income level and stress of experiencing physical symptoms and social life stress are related feeling of wellbeing of the patient. All three factors explained 62.59% of total variability in QoL. A study by Valency *et al*. found that the number and severity of foot ulcers are associated with HRQoL, especially in terms of leisure activity.[14] Tamilselvan in his study found that DFU patients were least satisfied with their health followed by their social and economic aspects and were most satisfied with their psychological/spiritual aspects followed by family aspects.[15]

In the present study, two-tailed *t*-test revealed [Table 3] that patient's income and social life experience and daily living experience were negatively correlated ($r = -0.227$, $P = 0.013$) and ($r = -0.224$, $P = 0.015$) significant at 0.05 level. A three-factor analysis (varimax rotation) also showed [Table 4] that the factor of "wellbeing" is affected by daily living experience (0.796) and daily living stress (0.793). When the factor "quality of life" is increased, the satisfaction level on QoL (0.978) is increased. When the factor "income" is better, the social life stress (0.485) is reduced. Hiren Sanghani *et al.* study had found the same association between HRQoL and HbA1c levels, where patients with tight glycemic control helped in better ulcer healing and improved the mobility of the leg with better QoL.

HRQoL has been deteriorated in all domains like social, wellbeing, physical symptoms and overall QoL in patients with diabetes foot ulcer as shown by increased scores in "Cardiff wound impact questionnaire". Diabetic foot is associated with severely impaired HRQoL in both physical and mental health aspects.[11] Many studies have illustrated the mechanism of stress in slowing the healing rate of acute and chronic ulcers, which leads to long-term ulcer care and this creates further burden, pressure and low QoL.[16] An understanding of the determinants of DFU patients' QoL may help health professionals in clinical decision-making, specifying risk groups, and allowing the planning of interventions.

Conclusion

Diabetic foot ulcers influences the quality of life of patients influencing the psychological factors. It is important for the health-care team to create the awareness on measures to prevent foot ulcers, early detection, and treatment among the diabetic peoples and their caregivers.

Conflicts of interest
There are no conflicts of interest.

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