

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 ulcers, an important factor of mortality among DM patients, have a massive impact on the quality of life (QOL) of patients. Recent study aimed to investigate impact of chronic wound on quality of life among diabetic foot ulcer (DFU) patients.

Methods: A cross-sectional, descriptive study was conducted at the Foot Care clinic in a private hospital, Guwahati, Assam. Data was collected using a proforma, consisting of socio-demographic variables, Wagner Ulcer Classification and Cardiff Wound Impact Questionnaire (CWIQ) for data collection. Analysis of the data was done using descriptive and inferential statistical methods.

Results: Participants were 118 DFU patients with type 1 & 2 DM of which 81.4 % were male and 18.6% were female. About 66% were in Grade 2 and 38 % were Grade 3 of Wagner Ulcer Classification. Overall mean score for QOL was 6.27 while overall mean score for satisfaction on QoL was 7.01. Patients had highest score in the well-being domain and lowest in the social life stress. Computation of correlation matrix and factor analysis showed positive correlation between QoL and satisfaction, 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 significant impact on QoL ($p < 0.001$) with $r^2 = 62.59\%$. Factor analysis of correlation matrix found that physical symptoms and daily living experiences and social experiences and stress dominated factor 1 followed by satisfaction led QoL in factor 2 and social life stress was leading force in Factor 3.

Conclusion: Quality of life of patients with diabetic foot ulcers can be improved by educating the diabetic patients on the prevention and early detection of foot ulcers and other diabetic complications benefits of availing health care facility.

Keywords: Diabetic foot ulcer, Quality of life, Impact of wound

INTRODUCTION

Diabetes is a major health issue that has reached alarming levels: 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/or foot deformity [2]. Foot problems are common complications of diabetes and are associated with 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 among individuals with DM 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 of patients with diabetes mellitus and the financial

cost is considerable [5]. All domains of life such as physical, psychological, social and economic can be affected; and the degree of disruption is proportional to the severity of complication [6]. Reduction of quality of life in patients not only affects the outcome of treatment but also increases health care expenditures due to frequent referring to clinical care settings [7].

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Significance of the study

Our aim of the study was to determine the impact of diabetic foot ulcers on different components of patients' quality of life and determine its associated factors among patients with diabetic foot ulcers in a selected hospital of Guwahati, Assam, India.

Research question

- What is the quality of life among diabetic foot ulcer patients of India?
- What are the relationships between quality of life and the selected socio-demographic characteristics (age, gender, income, level of education)?
- What is the impact of wound on various domains of daily life?

METHODS

Study design

A cross-sectional descriptive study was conducted among 118 patients with diabetic foot ulcers who attended the foot clinic at a private hospital in India. Diabetic foot ulcer patients whose age was 18 years and above were included in the study. Patients who met the inclusion criteria were invited to participate in the study after explaining the purpose of conducting the study. Patients with history of stroke, cancer, or mental retardation were excluded. The study was approved by ethics committee of Marwari Hospital, registered with CDSCO, Government of India, Regd No. ECR/487/Inst/AS/2013/RR-16 and performed in accordance with the principles of Good Clinical Practice and other ethical principles. Informed consent was obtained from all participants prior to taking part in the study.

Pilot study

Pilot study was conducted on 10 patients for testing the feasibility of conducting the study.

Data collection

The data was collected during the period of 1st March, 2019 to 31st December, 2019. A structured questionnaire was used to collect data on socio-demographic information and clinical characteristics of patients. Cardiff wound Impact Questionnaire was used to collect data on overall quality of life and the effect of wound on the daily life of the patients. Other relevant data like presence of diabetes complications, comorbidity and biomedical data were obtained from the medical records of the participants available in the hospital.

Physical assessment

Ulcer assessment included ulcer site, ulcer duration (age of the wound) and ulcer classification grade 1, 2, 3, 4 or 5 according to the Wagner classification [8]. Peripheral vascular assessment of the lower limb was done by palpating dorsalis pedis and posterior tibial pulses, presence of

intermittent claudication and clinical symptoms like rest pain, edema, change in the color of the limb. Neurological assessment was performed for detecting the presence of neuropathic symptoms such as numbness, tingling pain and burning sensation and by using Tuning Fork 128 Hz for determining the vibration sensation. Assessment was performed for detecting the presence of any structural deformity of the foot and for any abnormality in the skin and nail conditions of the foot (Dry skin, callous, in growing or thickened nails, previous amputation). Foot wear assessment was done for the fitness and shape.

Cardiff Wound Impact questionnaire scale

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

Permission from the author was obtained for using the questionnaire. Both forward 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 scoring guidelines given. Items were aggregated from each component/subscales with total scores being 245, with no cut off value.

Measurements

Blood pressure of patients was measured using standard equipment. High blood pressure was labeled when patient's systolic blood pressure was ≥ 130 mm Hg or diastolic blood pressure ≥ 80 mm Hg or if the patient was diagnosed with hypertension, on antihypertensive drugs. Random blood sugar level and HbA1c was measured. Diabetes was considered to be controlled if the patient had HbA1c $< 7.0\%$ according to the American Diabetes Association (ADA) 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 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 skin. Patients were assessed also for the presence of previous diabetes related amputation.

Data analysis

Descriptive and Inferential statistics were used to analyze the data using SPSS software. Means and standard deviations (SD) and frequency distribution were used. One-way analysis of variance (ANOVA) was used to analyze the differences among group means. Multivariate analysis of variance was used to examine the net effect for each of the independent variable on quality of life scales and subscales. A p value of ≤ 0.05 is considered significant.

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 the below given (Table 1).

Table 1. Socio-demographic and clinical characteristics of the study participants (N=118).

S. No.	Demographic variables	Frequency (n)	Percentage
1.	Age		
	a) 21-40 years	06	(5.1%)
	b) 41-60 years	76	(64.4%)
	c) 61-80 years	36	(30.5%)
2.	Sex		
	a) Male	96	(81.4%)
	Female	22	(18.6%)
3.	Marital status		
	a) Single	02	(3.7%)
	b) Married	116	(98.3%)
4.	Education		
	a) Illiterate	04	(3.4%)
	b) Lower primary	05	(4.2%)
	c) Upper primary	06	(5.1%)
	d) High school	27	(22.9%)
	e) Higher secondary	45	(38.1%)
	f) Graduate	27	(22.9%)
	Post graduate	04	(3.4%)
5.	INCOME		
	a) Rs. 1000-25000	68	(57.6%)
	b) Rs. 25001-50000	26	(22%)
	c) Rs. 50001-75000	20	(16.9%)
	d) Rs. 75001-1,00000	04	(3.5%)
6.	ULCER GRADE		
	a) 0	01	(0.9%)
		08	(6.77%)

	b) 1	66	(55.9%)
	c) 2	38	(32.2%)
	d) 3	05	(4.2%)
	e) 4		
7.	MEDICATION		
	a) OHA	22	(18.6%)
	b) Insulin	83	(70.3%)
	c) Insulin and OHA	13	(11.1%)
8.	HbA1C		
	a) ≤ 10	69	(58.47%)
	b) ≥ 10	49	(41.53%)

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 was calculated and are presented in **Table 2**. The mean scores were 24.83 (3.87) 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”, 24.13 (6.11) for “physical symptoms and daily living experience stress”. The lowest percentage of scores (32.4%) were seen in the social life stress domain, the highest scores of percentage were seen in the “wellbeing” domain.

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
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Correlation of variables

Correlation analysis was to 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**.

Table 3. Correlation matrix of participant's variables.

	Income (Rs)	QoL	Satisfaction	Social life stress	Social life experience	Well-being	Physical symp and amp; daily living exp	Phys symp & amp; 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)	-0.087 (0.348)	-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)	-0.224* (0.015)	-0.202* (0.028)
QoL			0.725** (<0.001)	-0.178 (0.057)	-0.254** (0.006)	-0.131 (0.161)	-0.242** (0.009)	-0.261** (0.005)
Satisfaction				-0.249** (0.007)	-0.287** (0.002)	-0.228* (0.013)	-0.255** (0.005)	-0.366** (<0.001)
Social life stress					0.331** (<0.001)	0.183* (0.047)	0.253** (0.006)	0.270** (0.003)
Social life experience						0.483** (<0.001)	0.541** (<0.001)	0.565** (<0.001)
Well being							0.345** (<0.001)	0.374** (<0.001)
Phys symp & daily living exp								0.680** (<0.001)

Figure within parenthesis indicates p-value

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

Correlation Half Matrix was computed to analyze factors correlated with the quality of life scales. Blue cells in the figure shows, there is a positive correlation between QOL and satisfaction, social life stress and social life experience and physical symptoms experience (P value <0.05, 0.01). Orange cells in the figure explain the negative correlation between QOL and satisfaction with stressful experience of social life and physical symptoms experience. (p value<0.05, 0.01).

Multiple regression analysis reveals that of satisfaction had significant impact on QoL (p<0.001) while income, social

life stress, social life experience, well-being, 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 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%.

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
Phys symp and daily living experience	0.796	-0.091	0.099
Phys symp and daily living stress	0.793	-0.205	0.059
Initial eigenvalues/Total variance	3.17	1.34	1.06
% of variance	35.17%	14.94%	11.74%
Cumulative %	35.17%	50.11%	61.86%

DISCUSSION

Diabetes is a systemic disease with serious lower extremities manifestations including diabetic foot ulcers and diabetic foot infections 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 aimed to investigate the impact of diabetic foot ulcers on different components of patients' quality of life and determine its associated factors. In the current study, most of the participants were aged less than 70 years old (n=97).

Participant's mean age was 55 years while 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 diabetic foot ulcers had a mean age of 60.8 (SD=13.8).

Though our study did not specifically focus on older population, literature shows that diabetic foot ulcers increase with age. Among the participants, majority were males (n=96) while females were (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 $\geq 10\%$ (HbA1c).

Successful healing of DFUs often require long periods of treatment with additional limitations in patients' daily activities. This burden in the life of patients adversely affects health-related quality of life [8] and wellbeing which encompasses psychological, physical, spiritual, and cultural domains [9]. The psychological impact of living with a chronic wound is suggested to be of equal importance to and interrelated with the physical symptoms [8,10]. Recent US and UK studies showed that diabetic foot ulcers adversely affect the quality of life of patients [11,12]. The present study found that among diabetic foot ulcer patients, female diabetic foot ulcer patients had a mean QOL score of 6 while males had a mean score of 6.3. Present study revealed a significant correlation (positive) between satisfaction and quality of life at p value <0.01 level of significance. Women are likely to be more concerned about their health conditions and their impact on family environment than men, particularly among housewives. In agreement with our finding, most previous studies had shown that males had better QOL than females.

Diabetic foot ulcer patients have limited ability to perform activities of daily living resulting in various psychological effects and losing one's self esteem. In our study, multiple regression analysis (**Table 4**) of various domains revealed

that of satisfaction had significant impact on QoL ($p < 0.001$) while income, social life stress, social life experience, wellbeing, physical symptoms and daily living experience and daily living stress. It explained 62.59% of total variability in QoL. Study by Valency et al. found that number and severity of foot ulcers are associated with HRQOL especially in terms of leisure activity [13]. 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 [14].

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 (p value=0.227), (p value=-0.224) 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 quality of life (0.978) is increased. When the factor "income" is better the social life stress (0.485) is reduced. Hiren Sanghani et al. found the exact same association between HRQOL and HbA1c levels where patients with tight glycemic control helped in better ulcer healing, improved the mobility of the leg leading to quality of life.

HRQOL has been deteriorated all domains like social, wellbeing, physical symptoms and overall quality of life 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 [9]. 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 quality of life [15]. 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 [16].

RECOMMENDATIONS

For clinical practice

- ♣ Nurses must educate diabetic patients and their family members on the identification of risk factors of developing foot ulcers, self-foot care practices and measures to take for prevention of foot ulcer occurrence and recurrence.
- ♣ Nurses must assess patients on their awareness on causes and prevention of diabetic foot ulcers.

For future research

- ♣ Evaluation of the long term effect of educational intervention for the diabetic patients in the prevention

and early recognition of diabetic foot ulcers on the reduction of treatment cost, improvement in quality of life, prevention of recurrence of foot ulcers and major amputations.

CONCLUSION

The complex process of wound healing and the bio psychosocial factors influence the quality of life of patients with diabetic foot ulcers. It is important for the health care team to create awareness on measures to prevent foot ulcers, early detection and treatment among the diabetic people and their care givers.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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