Assessment of diabetic foot ulcer-related pain and its relationship to quality of life

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ABSTRACT

Background: This study was carried out based on the recent realisation about pain as a factor in diabetic foot ulcer (DFU) care and the significance and impact of DFU-related pain experiences on individual well-being.

Aim: To determine the presence of DFU-related pain and its relationship to quality of life (QoL).

Methods: This descriptive, cross-sectional study utilised the wound-related pain questionnaire and generic QoL instrument — the Medical Outcome Study Short Form (SF-12v2).

Results: All the participants (n=14) experienced DFU-related pain at rest and during performance of activities of daily living. In relation to dressing change, 78.6% of the participants reported the experience of DFU-related pain. DFU-related pain occurring as incident/background pain was significantly related to physical health status (physical functioning only) and mental health status (social functioning only), with $p<0.05$. General mental health concerning psychological distress and psychological well-being was found to be significantly related to DFU-related pain experienced in relation to dressing change ($p=0.03$).

Conclusion: DFU-related pain is inherent in patients with DFUs at rest, during performance of activities of daily living, and at dressing change, which could affect physical, social and mental functioning. To improve patients' QoL outcomes, clinical practice should therefore incorporate strategies to assess and treat DFU-related pain.

Keywords: *Diabetic foot ulcer, diabetic foot ulcer-related pain, quality of life.*

Key points

Pain is a possible feature of DFUs, irrespective of its aetiology: neuropathy, ischaemia or neuroischaemia and not only limited to DFU complications such as infection. The experience of DFU-related pain can be overwhelming, impacting on patients' QoL and may be triggered/worsened by dressing change procedure that is essential to facilitate ulcer healing.

This study, therefore, underpins the significance of the inclusion of pain assessment and its management in DFU care practice. For effective DFU care, it becomes imperative for wound care practitioners to embrace and adopt a pain management strategy that incorporates pain assessment, with a focus on identifying its causes, its impact on QoL and how the experience can be improved.

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INTRODUCTION

Diabetes mellitus is a chronic and life-threatening disease characterised by complications of various types which are also serious and debilitating in nature. Among the list of complications is diabetic foot ulcer (DFU), which is a major source of morbidity and mortality in patients diagnosed with diabetes mellitus in developing countries[1]. In Nigeria, the prevalence of DFU is currently on the increase, with a rate between 11.7% and 19.1%[2,3]. DFU has been found to impact quality of life (QoL) in various dimensions: physically, mentally, socially, and economically[4,5]. DFU can result in pain and insomnia, fatigue and limited mobility, social isolation and loneliness, a restricted life, loss of control, fear for the future[6], and a deficit in the performance of activities of daily living, which has been reported to adversely affect health-related QoL[7].

The management of wound-related pain is a major issue for professionals involved in the management of wounds of various aetiologies[8]. The aetiology of DFUs can be of neuropathic, ischaemic or neuroischaemic origin, with each type presenting with its own unique characteristics. Diabetic neuropathy is present in about 60% of patients with DFUs, which is often associated with nerve dysfunction that is characterised by sensory, motor, or autonomic impairment[9]. Peripheral vascular disease is another complication of diabetes mellitus that increases the risk of ulceration, infection and amputation as a result of the ischaemic insult that causes a decrease in blood supply and tissue perfusion to the lower extremities[10].

As shown in recent publications on DFUs[11-13], pain has been described as an inherent or possible feature of a DFU, irrespective of its aetiology and not only limited to the already known DFU complications related to infection, Charcot arthropathy or osteomyelitis[14]. With the additional burden of infection in DFUs, the experience of pain may become worsened, even in an insensate foot and thereby prevent or delay ulcer healing[15]. However, in clinical practice, there is a general misconception that patients with DFUs do not experience pain because of the sensory peripheral neuropathy complications associated with diabetes mellitus[16], which have been proved not to be true. In light of this clinical realisation, a relationship between DFU-related pain and QoL has been reported, with the experience of DFU-related pain impacting on patients' QoL[11,12,17]. DFU-related pain, irrespective of its causes, can be so intense and may affect patients' physical and psychological well-being, cause delay in healing, and constitute an economic burden as a result of the greater health care costs and reduced efficiency[12,16].

The experience of DFU-related pain can be overwhelming, and may be triggered/worsened by dressing change procedure that is essential to facilitate ulcer healing. However, this procedure has been wrongly perceived not to cause pain and is often carried out without any intervention to relieve pain[12]. Pain in relation to dressing change has been reported in the literature to be problematic and an issue of concern to many patients[18]. Dressing a DFU can be very demanding and stressful to the patients, and additional pain at dressing change may constitute psychological torture and emotional distress, which may further increase the burden associated with having a DFU. Assessing the presence of DFU pain prior to, during and after dressing change can help to prevent further trauma, minimise pain experience[8]; and promote adaptive health responses[19].

Pain is an issue that is largely unaddressed in the management of DFUs, as seen in many international guidelines, although some clinical research is trying to alert wound care practitioners about its impact on patients' well-being and the health care system at large[12]. A research study on DFU pain, carried out in a developing country/poor-resource setting like Nigeria, may help to support international findings on the relationship between DFU-related pain and QoL, and subsequently promote the need to holistically assess and manage DFU pain in concerned individuals. Therefore, this study aimed to assess the participants' QoL responses in relation to the pain experienced in DFUs.

METHOD

This was a descriptive, cross-sectional study, in which the study population was part of a larger study that utilised a purposive sampling technique in the recruitment of patients with wounds of any type/aetiology except cancer-related wounds in the University College Hospital, Ibadan, Nigeria[20]. The protocol was approved by the UI/UCH Institution Board (UI/EC/12/0206). The instruments for data collection were: an adapted, 37-item, wound-related pain questionnaire[21,22] and the one-week recall version of the Medical Outcome Study Short Form (SF-12v2) health survey (Licence number QM017769). The intensity of the DFU-related pain experienced as incident/background pain and in relation to dressing change was assessed through the use of visual analogue scale (VAS) of 0–10.

The SF-12 is a generic measure of health status and reflects the QoL of an individual. It assesses eight health domains, namely: physical functioning (PF); role limitations because of physical health problems (RP); bodily pain (BP); general health perceptions (GH); vitality in relation to energy or fatigue (VT); social functioning (SF); role limitations because of emotional problems (RE); general mental health concerning psychological distress and psychological well-being (MH). The PF, RP, BP and GH indicate the Physical Component Summary (PCS), which reflects the physical health status, while the VT, SF, RE and MH form the Mental Component Summary (MCS), which reflects the mental health status[23].

The participants' responses in the QoL section were entered into the quality Metric Health Outcomes™ Scoring Software 4.5 to generate the participants' health domain scores. The categorisation of the health domain scores in this study was based on the mean value of 50.0 (SD 10.0) obtained from the United States general population normative data, which formed the standard for interpreting SF-12[23]. A health domain score 'below 50.0' represents 'poor heath domain' while the score of '50.0 and above' represents 'good heath domain'.

At the end of the one-month scheduled duration for data collection, all the hospitalised patients with diabetes mellitus who met the larger study inclusion criteria that were admitted into the medical wards for the management of their foot ulcers participated in the study. The entire data were analysed using the Statistical Package for Social Science (SPSS) version 16 to generate relevant frequency distribution tables, cross tabulations and graphical charts that were used to draw inferences from the data. A chi-square test was used to determine the relationships between DFU-related pain and QoL health domains, at a significance level of 0.05.

RESULT

Demographic data and DFU history/characteristics

The total population of patients with DFUs was 14, out of the 109 participants in the larger study. Sex distribution was nine male to five female. The participants' age ranged from 40 to 70 years (mean 55.57, SD 8.67). The majority of the patients were self-employed (n=12), while the others were civil servants. Of the DFUs, 71.4% were as a result of trauma to the big toe/foot (n=10), and 28.6% resulted from shoe-related pressure on the big toe (n=4), which further extended and got distributed across the foot, with its size ranging from 8 cm^2 to 150 cm^2 (mean 61.57 cm^2, SD 38.39,

Table 1: Patients' history in relation to diabetes mellitus

Variable	Frequency/value
Type of diabetes	
Type 1	2
Type 2	12
Gender	
Type 1 (male/female ratio)	1/1
Type 2 (male/female ratio)	8/4
Duration of diabetes in mean (SD) years	7.93 (3.58), range 3–15
Regimen for glucose control:	
Insulin therapy	2
Oral hypoglycaemic agent	5
Combination of insulin/oral hypoglycaemic agent	7
Diet regulation	14

University of Texas diabetic wound classification of mostly Class B-grade 1). The mean duration of the DFUs was 8.29 weeks (SD 7.04, range 2–28 weeks). All the patients had infected foot ulcers, with characteristic signs: exudates (n=13); offensive odour (n=11); expanding wound size (n=14); presence of necrotic tissue (n=8); and maceration of wound edge (n=12); and all were on systemic antibiotics. In addition, the diabetic status of the patients are summarised in Table 1.

Experience of DFU pain

All the patients experienced DFU-related pain either at rest (n=4), on performance of activities of daily living most especially on movement (n=8), and at night (n=5). Of the patients, 21.4% experienced pain directly from the ulcer alone (n=3), while 78.6% of the patients experienced their pain from both the wound and the surrounding area (n=11). The mean duration of the experienced pain was 6.93 weeks (SD 7.63, range 1–24 weeks). Two patients described the quality of the experienced pain in terms suggestive of pain of neuropathic origin [stinging (n=1) and tingling (n=1)], while the other 12 participants described the quality of pain in terms suggestive of pain of nociceptive origin [sharp (n=3), stabbing (n=3), throbbing (n=6) and aching (n=4)]. The majority (n=9) of the patients reported the frequency of DFU pain as intermittent, while five patients reported it as being constant.

On rating the intensity of DFU-related pain experienced as either incident or background pain on a VAS of 0–10, the majority of the patients (85.7%, n=12) reported the experience to be of moderate to severe pain intensity, with the mean as 5.43 (SD 2.24, range 2–10) (Figure 1).

DFU pain experienced in relation to dressing change

Of the patients, 92.9% had their ulcer dressings changed on a daily basis (n=13), and on alternate days (n=1) by professional nurses, with dressing change involving the use of normal saline as a cleansing solution; plain gauze as dressing material; and honey as both debriding and granulating dressing agent. The majority of the patients experienced pain in relation to dressing change of their foot ulcers (n=11, 78.6%); out of which 54.5% (n=6) rated the pain as moderate in intensity (aggregate DFU pain rating). Ten patients experienced pain immediately after dressing change, with a mean duration of 7.4 (SD 9.24, min = 30 minutes, max = 24 hours). Two patients expressed that the DFU pain immediately after dressing changes "did not stop till the next day's dressing" Patients experienced the highest level of pain during the removal of old dressings (mean = 3.93), which was followed by the removal of the old dressing's bandage/plaster (mean = 3.50) and wound cleansing (mean = 3.36). Table 2 indicates the patients' rating of the pain experienced in relation to dressing change.

Analgesia

Out of the total population in this study, only nine participants (64.3%) were on a prescribed analgesic regimen for the management of DFU-related pain experienced as either incident or background pain. The prescribed analgesics were paracetamol (n=5) and tramadol (n=4), which they all reported as being effective. For the management of procedural pain, none of the patients had any form of analgesic as a premedication for the relief of DFU-related pain experienced in relation to their dressing change.

Impact of DFU pain experienced in relation to dressing change

Prior to dressing change: 28.6% of the patients experienced emotional disturbance characterised by anxiety and depression (n=4); 14.3% experienced disturbance in sleep as a result of background pain, anxiety and anticipation of pain in relation to the next day's dressing (n=2).

During dressing: 42.9% reported the experience of negative emotional feelings characterised by sadness, fear and anger (n=6); 21.4% reported the experience of physiological stress characterised by palpitation (n=3).

After dressing change: As a result of pain, four patients reported that they were unable to perform their activities of daily living (such as grooming, dressing and moving); and experienced emotional disturbance characterised by depression. Also, two patients expressed that they were worried, which impaired their ability to interact with family and friends.

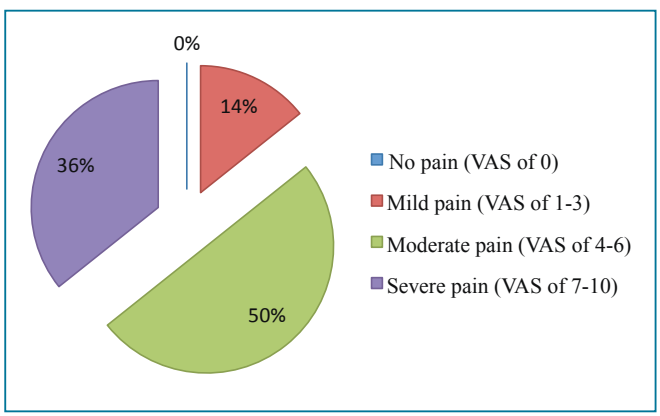

Figure 1: Intensity of DFU pain experienced as either incident or background pain

Table 2: Patients' rating of pain experienced during dressing change

DFU dressing-change stages	Rating of DFU pain experienced in relation to dressing change (VAS of 0–10)						
	No pain	Mild pain	Moderate pain	Severe pain	Mean	SD	Range
Prior to dressing change	3	6	4	1	2.71	2.13	0–7
During removal of old dressing's plasters/bandage	3	5	3	3	3.50	2.82	0–8
During removal of old dressing	3	2	6	3	3.93	2.73	0–8
During cleansing	4	4	4	2	3.36	3.10	0–8
During the application of dressing agent	4	3	6	1	3.21	2.46	0–7
During application of new dressings	3	7	3	1	2.86	2.18	0–7
After dressing change	4	5	2	3	3.14	2.71	0–8
Aggregate DFU pain rating in relation to dressing change of each patient	**3**	**4**	**6**	**1**	**22.71**	**1.61**	**0–48**

Health status

In general, the majority of the patients perceived their health status as fair (n=8), while four patients perceived it as good, with the other two as very good and poor, respectively. The majority of the patients agreed that their performance of daily activities was limited by their health (n=13). Also, all the patients experienced emotional problems related to depression and anxiety because they accomplished less than they would like and were less careful than usual in the performance of their daily activities. Pain interfered with their performance of daily activities (n=13). Table 3 presents detailed responses of the patients on the SF-12v2 QoL questionnaire.

Based on the patients' responses on the SF-12v2 QoL questionnaire as reflected in Table 3, the health domains scores were generated for each patient. The majority of patients scored below the standard value of 50.0 in PCS, MCS and in most of the health domains except for BP, VT and MH. Table 4 indicates the patients' score on each health domain. In totality, the study participants' QoL score based on the PCS and MCS reflected that most of the patients had poor physical health status (n=13, 92.9%) and poor mental health status (n=13, 92.9%).

Relationship between DFU pain and QoL

The chi-square test revealed that DFU-related pain experienced by patients was significantly related to their QoL. The asterisk p, as shown in Table 5, is less than 0.05, which indicated the areas of significant relationship observed in this study. DFU-related pain experienced as either incident or background pain was significantly related to PF and SF, which may further impact the patients' overall physical (PCS) and mental (MCS) health status. In relation to DFU dressing changes, a significant relationship was observed during dressing removal (P=0.04) and after dressing change (P=0.01) with GH. Also, the totality of DFU-related pain (aggregate) experienced in relation to dressing change was statistically significant with MH (P=0.03).

DISCUSSION

Originally the focus of the larger study was to assess the experience of wound-related pain and its relationship to QoL among patients with wounds of various aetiology ranging from pressure ulcer, leg ulcer, DFU, surgical wound, cellulitis, burn/scald, traumatic wound and scrotal ulcer. In the course of data analysis, the experience of pain among the patients with DFUs raised a point of concern to the researchers when compared with the larger study and thus necessitated further enquiry to reveal any underlying relationship. A total of 104 (95.4%) patients in the larger study experienced wound-related pain as incident or background pain. Out of this number of patients, 14 (13.5%) had DFUs. In relation to wound dressing change, 100 (91.7%) patients experienced wound dressing change-related pain, out of which 11 (11.0%) of the patients had DFUs. Thus this study result is significant, as it negates an earlier assumption, which states that patients with DFUs do not experience pain as a result of sensory peripheral neuropathy complications of diabetes mellitus[24,25].

In recent times, wound care practitioners have continuously demonstrated that healing cannot be adequately controlled if a patient's experience of pain is not effectively managed[26]. In this study, DFU pain was experienced as both incident and background pain[8] by all the participants. This study further support the findings of Bengtsson *et al.*[11], which revealed that more than 50% of patients with DFUs experienced wound-related pain; and that of Ribu *et al.*[17] who reported that 75% of their study participants experienced DFU-related pain, out of which 57% of the participants reported specific DFU pain on movement and at night. Implicitly, the patients' experience of pain becomes an important issue that must be systematically and holistically addressed by all wound care practitioners instead of being preoccupied and concerned only with the treatment of the visible pathology of the DFU[27]. In order to improve the lives of individuals with DFUs, the client and not just the wound (DFU) should become the focal point of care[28].

Table 3: Patients' health status response on SF-12v2 QoL questionnaire

QoL domains	Number of patients				
General health perception (GH):	**Excellent**	**Very good**	**Good**	**Fair**	**Poor**
Question 1	–	1	4	8	1
Physical functioning (PF):	**Yes limited a lot**	**Yes limited a little**	**No not limited at all**		
Question 2a	7	6	1	–	–
Question 2b	8	5	1	–	–
Role limitation because physical health problem (RP):	**All of the time**	**Most of the time**	**Some of the time**	**A little of the time**	**None of the time**
Question 3a	5	6	2	1	–
Question 3b	4	8	1	1	–
Bodily pain (BP):	**Not at all**	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**
Question 5	1	4	4	1	4
Role limitation because emotional problem (RE):	**All of the time**	**Most of the time**	**Some of the time**	**A little of the time**	**None of the time**
Question 4a	6	3	5	–	–
Question 4b	4	6	4	–	–
Mental health (MH):					
Question 6a	2	2	5	5	–
Question 6c	–	7	4	1	2
Vitality (VT):					
Question 6b	–	3	4	7	–
Social functioning (SF):					
Question 7	5	8	–	1	–

Furthermore, the term used by the study participants to describe their DFU-related pain were terms common to both nociceptive and neuropathic pain, which is similar to that seen among patients with chronic wounds[8,12]. The reported intensity and frequency of DFU pain varied among the participants, mostly as moderate to severe pain and intermittent or constant pain respectively. The reported DFU pain intensity was similar to that reported by Bradbury and Price[12] in their study. The control of DFU-related pain with prescribed analgesics was poor among the study population. According to WUWHS[8], an unacceptable level of background pain, usually above 4 (on a scale of 1–10) should be promptly reviewed and improved with an analgesic regimen, while a score below 4 may indicate a level of discomfort that may be acceptable but should be looked into and monitored through an ongoing evaluation and reassessment program as individual responses and tolerance to pain may differ. The assessment of a patient's level of pain is very important, and should not be limited to only those who experience a high level of pain. The patients who report little pain may be at a greater risk of trauma resulting from inappropriate ulcer management, which subsequently worsen the ulcer and further delay the time of healing[16].

The participants' experience of DFU pain in relation to dressing change was quite striking as 78.6% of the participants in this study reported the experience of mild to severe pain, mostly during the removal of old dressings, bandage/plaster removal and during wound cleansing. This result somewhat support the documented findings of a study comparing the experience of pain in patients with DFUs with the perceptions of clinicians in Upton *et al.*[16], as 48% of the study participants reported the experience of moderate to severe pain due to dressing change. These findings could have implications for the practice of clinicians involved in the management of DFUs[13,16], as none of the participants in this study had an analgesic in relation to dressing change as an intervention for the relief of procedural pain[8]. Wound dressings play a significant role in the management of DFU[29]. Therefore, special consideration should be given to the wound dressing change procedure in its entirety, with a focus on the selection and use of dressings that not only maintain an optimal, moist wound healing environment, but are atraumatic to the wound bed and surrounding skin, and do not cause pain and trauma, especially on removal[30]. In addition, other factors such as the ability to effectively absorb exudate, encourage granulation

Table 4: Patients' score on the health domains

Domain	Mean	SD	Range	Frequency		Percentage
PCS	34.13	9.26	14.29–51.33	**b**	13	92.9
				a	1	7.1
MCS	33.16	9.08	18.18–52.27	**b**	13	92.9
				a	1	7.1
PF	31.87	9.60	22.86–56.51	**b**	13	92.9
				a	1	7.1
RP	23.21	20.71	0.00–75.00	**b**	12	85.7
				a	2	14.3
BP	44.64	34.22	0.00–100.0	**b**	5	35.7
				a	9	64.3
GH	37.50	23.10	0.00–85.00	**b**	9	64.3
				a	5	35.7
VT	42.85	2.06	25.00–75.00	**b**	7	50.0
				a	7	50.0
SF	19.64	20.04	0.00–75.00	**b**	13	92.9
				a	1	7.1
RE	24.11	19.89	0.00–50.00	**b**	11	78.6
				a	3	21.4
MH	49.11	25.22	25.00–100.0	**b**	7	50.0
				a	7	50.0

Key: **b**= QoL domain score value below 50.0
a= QoL domain score value of 50.0 and above

or epithelialisation, stay in situ on application, remain intact throughout wear time, ease of application, patient's comfort and dressing fit should also be given due consideration in DFU care[13,31].

Pain is a major factor that can constrict an individual's functional ability and psychological well-being. In this study, the DFU-related pain experienced was found to be significantly related to the physical functioning, social functioning and general mental health domains of QoL. Furthermore, disturbance in emotion and sleep, physiological distress, inability to perform activities of daily living and interact with family members were the major QoL problems that were experienced by the participants as a result of DFU-related pain in relation to dressing change. In other related studies, DFUs have also been reported to be very painful, limiting daily and social activities and impacting on psychological well-being, which further leads to a reduction in QoL[12,32,33]. DFU-related pain in this study population has been identified as a significant clinical problem that has a negative impact on a client's QoL. It therefore needs to be promptly addressed through the adoption of a patient-centred and holistic approach, with the aim to facilitate the assessment and management of wound-related pain, to increase clients' functional ability and optimise their well-being.

CONCLUSION

This study has been able to reveal that the pain experienced by this study population is a clinical problem that calls for urgent attention by wound care professionals, irrespective of its causes, as it may signal the onset of limb-threatening complications and increase the prevalence of limb amputation. Limitations of this study relate to its small sample size; failure to categorise the ulcer based on its aetiology: neuropathic, ischaemic or neuroischaemic; and empirically determine and narrow down the causes of the ulcer pain among the patients, making it difficult to generalise the findings of this study.

However, it is worth noting that by acknowledging the patients' experience of pain and coming to terms with the reality of its effect on patients' QoL will better the outcome of DFU care. Holistic and effective DFU care should, therefore, incorporate an appropriate and timely analgesic regimen in addition to pressure offloading and optimal diabetes control[34,35]. Although the management of DFUs can be very challenging, the complaint of pain in DFUs can help to direct clinical efforts towards the development of comprehensive DFU care that focuses on identifying its causes, its impact on QoL and how

Table 5: Chi-square test of relationship between DFU-related pain and QoL

DFU Pain		PCS	MCS	PF	RP	BP	GH	VT	SF	RE	MH
Incident/background pain	X^2	6.46	6.46	6.46	2.90	1.31	4.29	0.34	6.46	1.78	0.34
	P-value	*0.04	*0.04	*0.04	0.23	0.52	0.12	0.84	*0.04	0.41	0.84
Pain prior to dressing change	X^2	3.95	3.95	3.95	1.75	1.30	7.10	2.33	3.95	5.59	3.00
	P-value	0.27	0.27	0.27	0.63	0.73	0.07	0.51	0.27	0.13	0.39
Pain during removal of old dressing's plasters/bandage	X^2	3.95	3.95	3.95	2.02	1.80	7.61	5.47	3.95	2.12	5.47
	P-value	0.27	0.27	0.27	0.57	0.61	0.06	0.14	0.27	0.55	0.14
Pain during removal of old dressing	X^2	3.95	3.95	3.95	1.75	2.39	8.19	6.00	3.95	1.13	5.33
	P-value	0.27	0.27	0.27	0.63	0.55	*0.04	0.11	0.27	0.77	0.15
Pain during cleansing	X^2	2.69	2.69	2.69	1.75	0.93	4.20	3.00	2.69	2.12	5.00
	P-value	0.44	0.44	0.44	0.63	0.83	0.24	0.39	0.44	0.55	0.17
Pain during the application of dressing agent	X^2	2.69	2.69	2.69	1.07	2.02	7.10	1.33	2.69	4.60	5.00
	P-value	0.44	0.44	0.44	0.78	0.57	0.07	0.72	0.44	0.20	0.17
Pain during application of new dressing	X^2	3.95	1.08	3.95	2.33	1.97	4.87	5.62	1.08	6.08	4.48
	P-value	0.27	0.78	0.27	0.51	0.58	0.18	0.13	0.78	0.11	0.21
Pain after dressing change	X^2	2.69	2.69	2.69	5.83	2.60	11.10	2.53	2.69	5.59	3.53
	P-value	0.44	0.44	0.44	0.12	0.46	*0.01	0.47	0.44	0.13	0.32
Aggregate DFU pain rating in relation to dressing change of each patient	X^2	6.46	1.94	6.46	4.20	1.80	5.14	4.80	1.94	6.08	8.67
	P-value	0.09	0.59	0.09	0.24	0.61	0.16	0.19	0.59	0.11	*0.03

the experience can be improved. Finally, to improve clients' QoL responses and achieve an optimal clinical outcome among affected patients with DFUs in relation to wound-related pain experiences, it becomes imperative for wound care practitioners to develop strategies to assess and manage pain holistically.

Recommendations for future research

As a result of this study limitation, there is a need for further research in a larger population of individuals with DFUs to:

- determine the characteristics of wound-related pain associated with DFUs of various aetiologies
- evaluate the effect of DFU-related pain on QoL
- identify factors associated with DFUs impact on QoL.

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