Prevalence and clinical characteristics of wound care patients in the northernmost state hospital of Malaysia: a retrospective analysis

This study aimed to describe the prevalence and clinical characteristic of patients at the Wound Care Unit, Hospital Tuanku Fauziah, Malaysia, and factors associated with chronic wounds among the patients. A retrospective secondary data analysis of 254 patients presenting from January until December 2022 was performed. Significant associations were found between chronic wounds in patients who had cerebrovascular accident (P=0.012) and initial wound size (P=0.029). The prevalence of chronic wound was 77.6%. Identifying the key risk factors associated with delayed wound healing in each patient is important for successful treatment.

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Key words
- Chronic wounds
- Wound care
- Wound healing

Wounds occur when there is damage to the integrity of biological tissue, including skin, mucous membranes and organ tissues (Vieira et al, 2018). Wounds can be classified as acute or chronic. A chronic wound is a wound that does not heal in an orderly set of stages over a period of 3 months (Bowers and Franco, 2020). Wound healing is a complex process that moves through four stages: haemostasis, inflammation, proliferation and maturation. Chronic wounds generally do not progress past the inflammatory phase (Powers et al, 2016). It is crucial to ensure wounds are cleaned and dressed properly to limit the spread of infection and further damage.

Aims

This study aimed to describe the prevalence and clinical characteristics of Wound Care Unit patients of Hospital Tuanku Fauziah (HTF), Malaysia, from January 2022 until December 2022 and to determine factors associated with chronic wounds among the patients. HTF is the northernmost state hospital in Malaysia.

Methods

Study design

This was a cross-sectional study. A retrospective secondary data analysis of all patients registered in the Wound Care Surveillance Database of Wound Care Unit, HTF from 1 January 2022 to 31 December 2022 was undertaken. Inclusion criteria included all inpatient and outpatient cases with an acute wound. Exclusion criteria included chronic cases with wounds >3 months' duration upon referral to the unit and cases with insufficient information and documentation in the database (>5% incomplete data).

Sampling data

A total of 266 patients were referred for wound dressings either as an inpatient or outpatient. Twelve patients were excluded because they had wounds >3 months' duration and 254 patients were included in this study.

Data collection

Data of 254 patients presenting with an acute wound were analysed from the Wound Care Surveillance Database of Wound Care Unit HTF and patient's assessment records. Data were transcribed into data collection forms by the study team members; this included age, gender, ethnicity, smoking status, comorbidity of diabetes, hypertension, cerebrovascular disease, peripheral vascular disease, wound type, site of wound and wound size. The patients' name was replaced with an identification number on the data collection form to maintain privacy. The data were transferred into Microsoft Excel and analysed using SPSS. All data were entered into a computer which is password-protected.

The confidentiality of the data was maintained at the highest level possible, as all forms were anonymised. An identification number were used on the subject data sheet. All data were entered using a password-protected computer. Data were then copied to CDs and all the data on the computer were erased. CDs and hardcopy data were stored in a locked office and maintained for a minimum

Declarations
The authors have no conflict of interests.

of 3 years after the completion of the study. The CDs and data will be destroyed after that period.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics (Version 19.0). Descriptive statistics were used to illustrate the clinical characteristics of patients. In this study, the findings of descriptive statistics presented as frequencies and percentages. Normality of data were identified using Kolmogorov-Smirnov and Shapiro-Wilks tests where data are normally distributed if the tests are insignificant with $P>0.05$. Numerical data (age, initial size of wound) were presented as means and standard deviations if normally distributed and, if not, as medians and interquartile range. Categorical data, such as age category, gender, ethnicity, smoking habit, diabetes mellitus, hypertension and cerebrovascular disease, peripheral vascular disease, type of wounds, site of wound, size of wound category and number of wounds were analysed using chi-squared or Fisher's exact test. A value of $P<0.05$ was considered statistically significant.

Results

Table 1 shows the demographic and patient characteristics. Data from 254 patients who presented with acute wounds were analysed and 77.6% did not heal within 3 months and were classified as chronic wounds.

Table 2 shows the association between factors affecting wound healing and subsequent development to a chronic wound. Significant associations ($P<0.05$) with development of a chronic wound were identified with CVA ($P= 0.012$) and initial wound size ($P=0.029$). Diabetes and smoking were observed to contribute to a higher risk of a chronic wound.

Discussion

Wound healing can be affected by both local and systemic factors (Han and Ceilley, 2017). Local causes include lack of oxygen supply to the skin, wound infection, foreign bodies and venous insufficiency (Agale, 2013). Systemic factors include advancing age, ischaemia, obesity, smoking, anaemia, diabetes, poor nutrition and immunosuppressant medications (Agale, 2013; Raeder et al, 2020). Impaired wound healing frequently has multiple underlying causes that can affect the normal healing trajectory.

In our study, we found significant association between development of a chronic wound and cerebrovascular accident (CVA). Immobilisation and prolonged immobility as

Table 1. Demographic and characteristics of patients.

	n (%)	Mean (SD)
Age (years)		56.9 (16.4)
<18	5 (2.0)	
18-49	66 (26.0)	
≥50	183 (72.0)	
Sex		
Male	135 (53.1)	
Female	119 (46.9)	
Ethnicity		
Malay	241 (94.9)	
Chinese	7 (2.8)	
Indian	1 (0.4)	
Other	5 (2.0)	
Smoking		
Yes	134 (52.8)	
No	120 (47.2)	
Diabetes		
Yes	173 (68.1)	
Now	81 (31.9)	
Hypertension		
Yes	117 (46.1)	
No	137 (53.9)	
Peripheral vascular disease		
Yes	8 (3.1)	
No	246 (96.9)	
Cerebrovascular accident		
Yes	49 (19.3)	
No	205 (80.7)	
Number of wounds		
Single	250 (98.4)	
Multiple	4 (1.6)	
Type of wound		
Diabetic	114 (44.9)	
Pressure	52 (20.5)	
Trauma	18 (7.1)	
Surgical	5 (2.0)	
Burn	2 (0.8)	
Other	63 (24.8)	
Site of wound		
Head and neck	10 (3.9)	
Trunk	75 (29.5)	
Upper limb	14 (5.5)	
Lower limb	155 (61.0)	
Initial size of wound (cm²)		35.5 (46.0)*
1–10	39 (15.4)	
11–20	49 (19.3)	
21–30	28 (11.0)	
31–40	37 (14.6)	
41–50	23 (9.1)	
>50	78 (30.7)	
Duration before referral (weeks)		
1-12 weeks	254 (95.5)	
>12 weeks	12 (4.5)	
Referring department		
Orthopaedic	162 (63.8)	
Surgical	33 (13.0)	
Medical	33 (13.0)	
Obstetrics and gynaecology	2 (0.8)	
Others	24 (9.4)	
Outcome (chronic wound)		
Yes	197 (77.6)	
No	57 (22.4)	

*Median, interquartile range (IQR)

a result of a CVA increase the risk of pressure ulcer development (Guo and DiPietro, 2010). It has been stated that the geriatric population are at higher risk of pressure ulcers due to poor muscle tone and immobility, often worsened after having a CVA, and associated with the aging process (Jaul et al, 2018).

Pressure ulcers are one of the most common chronic wounds in people who have had a CVA (Werdin et al, 2008). Healing of pressure ulcers requires restoration of good tissue perfusion, which can be achieved by relief of the pressure to the wound area and treatment of the underlying systemic illness (Jaul, 2010), yet this can be challenging for those people who have had a CVA due to difficulty in mobility. It is essential that pressure ulcers are managed effectively and in a timely manner to prevent infection especially in an ageing population where not all patients would be suitable for surgical intervention (Frykberg and Banks, 2015).

Advancing age has been associated with chronic wounds and delayed wound healing (Wicke et al, 2009). Diseases that delay the wound healing process are common among elderly patients (Wicke et al, 2009). A previous study by Swift et al (2001) highlighted that delayed wound healing in elderly patients is due to disruption of the inflammatory response, such as delayed infiltration of T-cells into the wound area.

According to a study by Gosain and DiPietro (2004), each stage of wound healing undergoes characteristic age-related changes. These changes include enhanced platelet aggregation, increased secretion of inflammatory mediators, delayed infiltration of macrophages and lymphocytes, impaired macrophage function, decreased secretion of growth factors, delayed re-epithelialisation, delayed angiogenesis and collagen deposition, reduced collagen turnover and remodelling, and decreased wound strength.

Diabetes is one of the systemic factors that may delay wound healing. Prolonged wound healing is often noted in people with diabetes due to chronic inflammation (Mieczkowski et al, 2022). People with diabetes tend to develop glycosylated vessels and as a result, tissue perfusion is impaired and local ischaemia to the skin occurs (Akbari and LoGerfo, 1999). Moreover, people with diabetes are at higher risk of chronic wounds especially in the feet (Akbari and LoGerfo, 1999). Afonso et al (2021) stated that diabetic foot ulcers are at a higher risk of infection due to biofilm-producing bacteria that are resistant to many antibiotics, causing an increased wound healing time

Smoking can impair the wound healing process in multiple ways (Ahn et al, 2008). Smoking causes increased oxidative stress and apoptosis of vascular endothelial cells. In other ways, nicotine as a known vasoconstrictor impaired wound healing by acting directly on the endothelial lining. At higher concentrations,

Table 2. Association between factors affecting wound healing and chronic wounds.

Demographic and factors affecting wound healing	Acute wound (n=254)		p-value*
	Healed within 3 months n=57 (%)	Chronic wound n=197 (%)	
Age (years)			0.173†
<18	2 (3.5)	3 (1.5)	
18-49	19 (33.3)	47 (23.9)	
≥50	36 (63.2)	147 (74.6)	
Sex			0.098
Male	36 (63.2)	99 (50.3)	
Female	21 (36.8)	98 (49.7)	
Ethnicity			0.135†
Malay	52 (91.2)	189 (96.0)	
Chinese	3 (5.3)	4 (2.0)	
Indian	1 (1.8)	0 (0.0)	
Other	1 (1.8)	4 (2.0)	
Smoking			0.292
Yes	34 (59.7)	100 (50.7)	
No	23 (40.4)	97 (49.3)	
Diabetes			0.146
Yes	34 (59.7)	139 (70.6)	
No	23 (40.4)	58 (29.4)	
Hypertension			0.764
Yes	25 (43.9)	92 (46.7)	
No	32 (56.1)	105 (53.3)	
Peripheral vascular disease			0.688
Yes	1 (1.8)	7 (9.6)	
No	56 (98.3)	190 (90.4)	
Cerebrovascular accident			**0.012**
Yes	4 (7.0)	45 (22.8)	
No	53 (93.0)	152 (77.2)	
Number of wounds			0.578†
Single	57 (100.0)	193 (98.0)	
Multiple	0 (0.0)	4 (2.0)	
Type of wound			0.102†
Diabetic	29 (50.9)	85 (43.1)	
Pressure	6 (10.5)	46 (23.4)	
Trauma	7 (12.3)	11 (5.6)	
Surgical	1 (1.8)	4 (2.0)	
Burn	1 (1.8)	1 (0.5)	
Other	13 (22.8)	50 (25.4)	
Site of wound			0.111
Head and neck	1 (1.7)	9 (4.5)	
Trunk	11 (19.3)	64 (32.5)	
Upper limb	5 (8.8)	9 (4.6)	
Lower limb	40 (70.2)	115 (58.4)	
Initial size of wound (cm²)			**0.029**
1–10	16 (28.0)	23 (11.7)	
11–20	13 (22.8)	34 (17.3)	
21–30	4 (7.0)	25 (12.7)	
31–40	7 (12.3)	30 (15.2)	
41–50	5 (8.8)	18 (9.1)	
>50	12 (21.1)	67 (34.0)	

*Pearson chi-squared test. †Fisher's exact test

nicotine increases platelet aggregation and blood viscosity causing impairment of microvascular perfusion (Kim and Chen, 2021). Fan Chiang et al (2023) found that current smokers who underwent surgery had approximately 65% increased chance of developing wound disruption.

Kokkinidis et al (2020) studied 264 patients with chronic limb ischaemia undergoing endovascular interventions and reported that the active smoking group had a longer wound healing period (P=0.009). After 6 months of follow-up, they found significantly higher rates of incomplete wound healing (P=0.012) among the active smoking group.

Most of the patients with chronic wounds in our study had a wound >50cm^2 upon initial presentation to the clinic setting. Larger wounds can take weeks or months to heal as there is significant tissue damage (Bosanquet and Harding, 2014). Excessive inflammation and alterations in the wound bed flora are usually present in chronic wounds (Bosanquet and Harding, 2014). Margolis et al (2004) showed that baseline wound size and wound duration had an effect on the incidence of complete healing. Their study described the likelihood of wounds not healing in a patient with a given prognostic factor or combination of prognostic factors. As an example, a wound >10cm^2 and >12 months' duration had a 78% chance of not healing. Skene et al (1992) also identified that wound size and wound age are good prognostic markers of wound healing.

Limitations

Our main limitations were the lack of information on certain important risk factors associated with wound healing such as haemoglobin level for anaemia status, BMI for obesity, nutritional status for malnutrition, immunosuppressant medications, such as steroids and chemotherapy drugs. Most of this information was not recorded in the data surveillance and patient assessment record.

Conclusion

Our study identified 77.6 % prevalence of chronic wounds among patients of the Wound Care Unit, HTF. Significant associations were found between chronic wound with CVA (P=0.012) and initial wound size (P=0.029). Diabetes and smoking contribute to a higher proportion of chronic wounds. Identifying the key risk factors associated with delayed wound healing in each patient is important for the successful treatment. Early and vigorous treatment of wounds that does not improve with standard care should be done to reduce the burden of chronic wounds.

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Institutional Review Board Statement

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