






## Predictive factors for worsening chronic wounds\*

### Fatores preditores ao agravamento de feridas crônicas

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#### Special Call 2 - Stomatherapy Nursing

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#### ABSTRACT

**Objective:** to analyze the predictive factors for the aggravation of chronic wounds. **Methods:** quantitative, cross-sectional study, whose collection was performed using the Bates-Jensen Wound Assessment Tool. For data analysis, the independent t test, analysis of variance and multiple linear regressions were applied. The level of significance adopted was 0.05. **Results:** in the bivariate analysis, it was observed that the variables making use of tobacco ( $p=0.005$ ), presenting food restriction ( $p=0.001$ ), signs of infection ( $p=0.005$ ), odor characteristics ( $p<0.001$ ) and evaluation pain ( $p=0.012$ ) contributed to the worsening of chronic wounds. **Conclusion:** it was found as predictors for the worsening of wounds: using tobacco, having food restriction of the hypo sodium or hypoglycemic type, in addition to presenting edema in the surrounding area, as a sign of infection. **Descriptors:** Nursing; Primary Health Care; Wounds and Injuries.

#### RESUMO

**Objetivo:** analisar os fatores preditores ao agravamento de feridas crônicas. **Metódos:** estudo quantitativo, transversal, cuja coleta foi realizada por meio do instrumento *Bates-Jensen Wound Assessment Tool*. Para análise dos dados, aplicaram-se o teste t independente, a análise de variância e a regressão linear múltipla. O nível de significância adotado foi 0,05. **Resultados:** na análise bivariada, observou-se que as variáveis fazer uso de tabaco ( $p=0,005$ ), apresentar restrição alimentar ( $p=0,001$ ), sinais de infecção ( $p=0,005$ ), características do odor ( $p<0,001$ ) e avaliação da dor ( $p=0,012$ ) contribuíram para o agravamento das feridas crônicas. **Conclusão:** constatou-se como preditores para o agravamento de feridas: fazer uso de tabaco, possuir restrição alimentar do tipo hipossódica ou hipoglicemiante, além de apresentar edema na área perilesional, como sinal de infecção. **Descritores:** Enfermagem; Atenção Primária à Saúde; Ferimentos e Lesões.

## Introduction

The increase in the incidence and prevalence of chronic wounds in the Brazilian population is a public health problem, since the chronification process implies economic impacts, such as high costs for the health system and the demand for specialized services<sup>(1)</sup>. In addition, psychosocial consequences are pointed out, such as the development of physical issues, due to changes in body image, the inability to perform activities of daily living and problems in family life, since wound care becomes collective responsibility<sup>(2)</sup>.

Chronic wounds are those that remain for a longer time in the inflammatory phase, which slows down the proliferative phase, requiring more time for tissue healing, making this process go beyond the time of three months<sup>(3)</sup>. Among them, pressure injuries, diabetic foot and vasculogenic ulcers (arterial, venous or mixed) stand out.

Venous ulcers, caused by chronic venous insufficiency, are the most frequent, either due to the high incidence, high cost and duration of treatment, as well as due to constant recurrence<sup>(4)</sup>. People with venous ulcers may present symptoms such as pain, exudative wounds, a foul odor, decreased mobility and discomfort due to dressings<sup>(5)</sup>.

Based on the data presented, the importance of a multidisciplinary approach to people with chronic wounds is verified, so that they receive systematic care, enabling early diagnosis and effective interventions. In this context, the nursing professional deals with the care of people with injuries on a daily basis, thus, it is necessary to have technical-scientific knowledge to support decisions and conduct conducts properly.

The nurse plays an extremely important role in caring for people with wounds, which goes beyond dressing, as it fully assists the patient, monitors the evolution of wounds, performs dressings at home and in different health services<sup>(6)</sup>.

In view of this, it is opportune to highlight the

relevance of research on this theme, as a way of enabling preventive and treatment measures, in addition to providing data to support assistance, resource management and research that support and substantiate such practice. In addition to this, the literature points to a scarcity of studies on chronic wounds and their prevalence, emphasizing that the lack of studies on the subject is not restricted to Brazil<sup>(3)</sup>. It is noted that such rates tend to increase due to the increase in population aging and the expansion of morbidities, among which metabolic and vascular diseases stand out<sup>(3-4)</sup>.

Therefore, although there are national publications of scientific studies and case reports involving etiology of wounds and coverings for treatment, there is still an incipient scientific production that links sociodemographic conditions, behavioral habits and attributes with worsening wounds. Thus, the objective was to analyze the predictive factors for the worsening of chronic wounds.

## Methods

Quantitative, cross-sectional study, developed in the Family Health Units of the municipality of Curitiba, located in the micro region of Curimataú, Paraíba, Brazil.

The population consisted of all individuals who had chronic wounds during the data collection period, provided that they met the inclusion criteria: 18-year-old patients or older that were followed up in the Family Health Strategy. The exclusion criteria established were: people with attention deficit and/or difficulty in answering questions, according to the nursing records contained in the medical records. Thus, intentional non-probabilistic sampling was determined, with 47 eligible people.

Data collection was carried out between December 2018 and June 2019, by a scientific initiation student, previously trained and supervised by the professor responsible for the research. We used a

data collection instrument developed by researchers from the Interdisciplinary Study and Research Group in Health and Nursing, containing socioeconomic aspects (gender, age group, home arrangement, remuneration activity, literacy); behavioral habits (they use alcohol, they use tobacco, food restrictions related to chronic diseases); wound attributes (etiology, type, location, pain assessment, odor characteristics, signs of infection); and assessing the evolution of wounds. It is noteworthy that for this last item, the Bates-Jensen Wound Assessment Tool<sup>(7)</sup> was used, composed of 13 items that assess size, depth, edges, detachment, type and quantity of necrotic tissue, type and quantity of exudate, edema and hardening of the peripheral tissue, skin color around the wound, granulation tissue and epithelialization. The scale to measure these items is a five-point Likert type, with 1 indicating better wound condition and 5 indicating worse condition. Finally, the score obtained with the sum of all items can vary from 13 to 65 points, and the highest scores imply worse wound conditions.

It is worth mentioning that, in a study that tested the reliability of the Bates-Jensen Wound Assessment Tool for assessing pressure injuries, it was detected, after 1,161 observations, an Intraclass Correlation Coefficient of 0.84, for the total points of the score<sup>(8)</sup>.

For data analysis, we used the Statistical Package for the Social Sciences software, version 20. In the inferential analysis, the normality of the numerical data was verified, through the Shapiro Wilk test. The independent t test and the analysis of variance were used to verify the differences between the averages of the measures of the Bates-Jensen Wound Assessment Tool with sociodemographic data and behavioral habits. To compare the averages of the Bates-Jensen Wound Assessment Tool with wound attributes (etiology, type, odor characteristics, signs of infection, pain assessment and location), analysis of variance was performed. Finally, multiple linear regressions were performed to verify whether the independent variables that obtained statistical significance in the

bivariate analysis were predictors of the Bates-Jensen Wound Assessment Tool score. The backward strategy was adopted to select the variables. Categorical variables were recoded as dummy type variables. In all analyzes, the level of significance adopted was  $<0.05$ .

The development of the study complied with the research standards involving human beings, being conducted after approval by the Research Ethics Committee of the Hospital Universitário Alcides Carneiro, according to opinion No. 2,706,795/2018.

## Results

47 participants were interviewed, of these, 28 (59.6%) were female, had a mean age of 64 years ( $\pm 14.0$ ), with ages ranging from 37 to 94 years, 35 (74.4%), lived with a spouse or other people, 42 (89.4%) were retired and received a minimum monthly wage, and 24 (51.1%) were illiterate.

Regarding behavioral habits, 39 (83.0%) did not use alcoholic beverages, 33 (70.2%) were not smokers. With regard to dietary restrictions, 24 (51.1%) had no limitations; the other participants had restraints related to the low-glycemic or low-sodium diet.

Table 1 shows the sociodemographic characterization, behavioral habits and the respective relationships with the scores of the Bates-Jensen Wound Assessment Tool Scale, showing the relationship between tobacco use and dietary restrictions with the worsening of chronic wounds.

Table 2 shows the relationship between the scores of the Bates-Jensen Wound Assessment Tool scale and the attributes of chronic wounds, with significant mean differences in odor characteristics, with the presence of the fetid odor being related to the increase the severity of the wound and the signs of infection, observing that the presence of edema confronts the increase in the severity of the wound and the assessment of pain, whose presence of moderate pain was connected to the greater severity of the wound.

**Table 1** – Comparison between the average of the Bates-Jensen Wound Assessment Tool questionnaire with the socioeconomic characteristics and behavioral habits of participants with chronic wounds. Cuité, PB, Brazil, 2019 (n=47)

Variables	f (%)	Bates-Jensen Wound Assessment Tool	
		Mean (standard deviation)	p-valor
Gender			
Female	28 (59.6)	30.6 (7.7)	0.357*
Male	19 (40.4)	28.6 (6.8)	
Age group (years)			
37-57	19 (40.4)	27.8 (7.1)	0.244†
58-77	19 (40.4)	31.8 (7.0)	
78-94	9 (19.2)	29.7 (8.1)	
Home arrangement			
Alone	12 (25.6)	32.3 (7.4)	0.180*
Spouse and/or others	35 (74.4)	29.0 (7.2)	
Remuneration activity			
Retired	42 (89.4)	29.9 (7.7)	0.558*
Active worker	5 (10.6)	29.0 (2.3)	
Literacy			0.139*
Yes	23 (48.9)	28.2 (3.4)	
No	24 (51.1)	31.4 (7.2)	
Use alcohol			0.270*
Yes	8 (17.0)	32.5 (6.4)	
No	39 (83.0)	29.3 (7.5)	
Use tobacco			0.005*
Yes	14 (29.8)	34.3 (5.7)	
No	33 (70.2)	27.9 (7.2)	
Food restriction			0.001*
Yes	23 (48.9)	33.4 (6.2)	
No	24 (51.1)	26.4 (6.8)	

\*Independent T test; †Anova test

**Table 2** – Comparison between the mean of the Bates-Jensen Wound Assessment Tool questionnaire with the attributes of chronic wounds. Cuité, PB, Brazil, 2019 (n=47)

Variables	f (%)	Bates-Jensen Wound Assessment Tool	
		Mean (standard deviation)	p-valor*
Etiology			0.829
Pathological	20 (42.6)	28.6 (8.3)	
External factors	8 (17.0)	30.8 (7.1)	
Traumatic	5 (10.6)	30.6 (7.3)	
Others	14 (29.8)	30.7 (6.6)	
Type			0.266
Pressure Injury	23 (48.9)	30.2 (6.6)	
Vascular ulcer	11 (23.4)	32.6 (7.2)	
Erysipelas	6 (12.8)	24.1 (10.7)	
Diabetic foot	4 (8.5)	29.5 (7.0)	
Others	3 (6.4)	28.6 (2.0)	
Odor characteristic			<0.001
Absent	23 (48.9)	26.1 (6.9)	
Characteristic	22 (46.8)	32.6 (5.7)	
Fetid	2 (4.3)	41.5 (0.7)	
Signs of infection			0.005
Hyperemia	18 (38.3)	31.2 (8.9)	
Absent	18 (38.3)	25.5 (4.1)	
Increased necrotic tissue	6 (10.6)	34.5 (4.6)	
Edema	5 (12.8)	35.0 (5.2)	
Pain assessment			0.012
Absent	22 (46.8)	30.3 (6.8)	
Light	14 (29.8)	25.6 (7.4)	
Moderate	11 (23.4)	34.1 (5.7)	
Location			0.342
Lower members	27 (57.4)	28.2 (6.8)	
Sacral/Trochanter/Gluteus	12 (25.5)	32.3 (7.3)	
Upper limbs	7 (14.9)	32.1 (9.1)	
Abdomen	1 (2.1)	28.0 (0.0)	

\*Anova test

In Table 3, the data show that the multiple regression coefficient explains 53.0% of the variation in the results. Thus, the independent predictors that determined the highest Bates-Jensen Wound Assessment Tool score and, consequently, worsening of the wounds were: using tobacco, having dietary restrictions and identifying surrounding edema as a sign of infection.

According to the weight of each variable in the model, expressed by the coefficient, it is inferred that using tobacco contributed 5.62 points to the Bates-Jensen Wound Assessment Tool score, presenting food restriction contributed 5.99 points to the score, and obtaining edema in the surrounding area cooperated 5.70 points on the score.

**Table 3** – Regression analysis model to determine the predictive effects on the Bates-Jensen Wound Assessment Tool score. Cuité, PB, Brazil, 2019 (n=47)

Variables	B*	†CI 95%		§p	R <sup>2</sup>
		Inferior limit	Upper limit		
Making use of tobacco (reference: no)					
Yes	5.62	1.97	9.27	0.003	
Food restriction (reference: no)					
Yes	5.99	2.81	9.17	<0.001	
Odor characteristic (reference: others)					
Fetid	7.53	-0.70	15.78	0.072	0.537
Signs of infection (reference: other)					
Edema	5.70	0.20	11.21	0.043	
Pain assessment (reference: others)					
Moderate	3.70	-0.09	7.50	0.056	

\*Non-standardized coefficient; †CI: confidence interval; §T test; ||Determination coefficient. The references “no” and “others” refer to the dummy variables that assumed the category “zero”

## Discussion

As a limitation, the absence of temporality is pointed out, due to the transversal design. It is believed that the evolution of the wound can also be determined by sociodemographic characteristics, behavioral habits and attributes of chronic wounds. Thus, longitudinal studies are suggested for clarification.

The findings of this study confirm that it is possible to perform nursing care guided by scientific precepts, in addition to contributing with researchers in the area, as a complex interaction of physiological and social factors was observed. The multifactorial nature of the chronicity of wounds implies difficulties in the handling of wounds, as well as the need to qualify the nursing team to make a correct decision.

In this study, the relationship between worsening chronic wounds and some sociodemographic factors, behavioral habits and attributes of chronic wounds was found. Among the behavioral habits that contribute to the worsening of chronic wounds, it is worth mentioning the use of tobacco, as it was found that among the smokers, the average of the evaluation score in the evolution of the wound was higher in relation to the non-smokers.

Research corroborates with the data found, as it points to evidence that the use of tobacco promotes the delay of the healing process, which culminates in aggravation and chronification, among the main complications, peripheral vasoconstriction stands out, which decreases the space of blood distribution and, consequently, reduces the nutritional supply in this region<sup>(9)</sup>. In addition, nicotine, which is the main component of cigarettes, impairs the transport of oxygen through red blood cells, causing hypoxia. Thus, the decrease in oxygen, in addition to compromising tissue proliferation and recombination, favors bacterial multiplication and consequent infection<sup>(9-10)</sup>.

Food restriction was also seen as a contributor to the increased severity of the assessed wounds, thus, individuals who had food restriction, had higher scores in the assessment of wounds. In the evaluated group, the limitations were related to chronic diseases, such as diabetes mellitus and arterial hypertension, which resulted in the adoption of a low-glycemic and/or low-sodium diet.

In another investigation, whose objective was to compare wound healing in diabetic and non-diabetic individuals, it was also attested that wound healing was significantly less in the diabetic group, when com-

pared to the non-diabetic group, as it suffers interference from systemic factors, related to the individual's general conditions, such as nutritional status and presence of chronic diseases<sup>(11)</sup>. Added to these elements, the healing process consumes energy, using mainly carbohydrate in the form of glucose, thus, in individuals with low-glycemic diets, an adequate supply of calories is necessary, so that the body does not use proteins in the healing process<sup>(12)</sup>.

Sociodemographic variables and alcohol consumption were not statistically significant in this study, and therefore are not determining factors for the worsening of chronic wounds. However, a survey conducted with 176 people showed that illiteracy directly affects adherence to self-care measures and the prevention of wounds, and it is possible to note the high number of these in this public<sup>(10)</sup>.

In addition, people with advanced age have greater difficulty in healing chronic wounds, due to the physiological changes caused by senescence, among them: cell atrophy, decreased collagen, loss of elasticity, and change in color, among others. These changes, when associated with decreased mobility, further increase the clinical worsening of the wounds<sup>(13)</sup>. With regard to the attributes of chronic wounds, significant mean differences were found in odor characteristics, signs of infection and pain assessment.

Research states that the fetid odor is directly related and present in chronic wounds, due to bacterial colonization in the injured tissue and the consequent formation of necrotic tissue, which causes, in addition to decreased tissue proliferation, social isolation, depression and shame<sup>(14)</sup>.

Regarding edema, it is pointed out that it is related to the worsening of the wound. Another study also brings this finding as a clinical aggravating factor for wounds, evidencing it as a factor of changes in water balance, in addition to anatomically deforming the site<sup>(15)</sup>. This impairs cellular metabolism by preventing communication between cells and capillaries, causing hypoxia and tissue death. Likewise, necrosis causes cell death in living tissues, progressively de-

grading cells and hindering angiogenesis for tissue reconstruction, often requiring mechanical and/or chemical stimulation, so that the wound returns to the progressive evolution in the process healing<sup>(16)</sup>.

Regarding pain, it was found that moderate pain worsens chronic wounds. In a research that investigated the quality of life in people with chronic wounds, the correlation between the time of the wounds and the pain score was evidenced, in which 71.7% of the interviewees reported pain, of these, 68.4% reported having pain strong to intense and prevalence of ulcers lasting more than five years (45.2%)<sup>(17)</sup>. In addition, pain is associated with the presence of numerous emotional and psychological impairments, which directly affects homeostasis and body metabolism, which, in a way, impairs the action of epithelial cells during proliferation for tissue reconstruction.

The etiology, type and location variables were not statistically significant in this study. However, it is known that these factors directly influence the recovery of wounds, those of pathological etiology, for example, alone present greater complications because they are associated with pre-existing diseases, whether acute or chronic<sup>(10)</sup>.

The location is also related to the difficulty of treatment, since those located in bony prominences are in constant pressure and shear, making tissue regeneration difficult<sup>(18)</sup>. Regarding the type of wound, there is greater severity in vascular ulcers, as they are linked to chronic venous insufficiency and chronic hypertension, which has systemic and local implications that affect cell proliferation<sup>(19)</sup>.

The regression model ratified the data shown in the bivariate analysis, since this technique simultaneously investigated the effects that several independent variables could cause on the dependent variable. Thus, it was found that 53.0% of the worsening of chronic wounds are due to behaviors such as using tobacco, having food restriction of the hypo sodium or hypoglycemic type, in addition to presenting edema in the surrounding area, as a sign of infection.

In a study, whose objective was to predict the

probability of healing in pressure injuries, it was possible to predict that the size, evidence of infection, the time of the pressure injury, the patient's age, lack of mobility and malnutrition influenced the healing process of wounds<sup>(20)</sup>.

The data corroborate the findings of this research, as they relate physiological and social aspects to wound healing. Therefore, due to the relevance of the subject studied, the development of longitudinal studies is recommended, due to the multifactorial nature that these phenomena cause in the healing process.

## Conclusion

It was found as predictors for the worsening of wounds: to use tobacco, to have food restriction of the hypo sodium or hypoglycemic type, besides presenting edema in the surrounding area, as a sign of infection.

The recognition of the aforementioned factors supports better decision-making in the Nursing area, which implies a faster healing process, with less financial, physical and psychosocial costs for patients with chronic wounds.

## Collaborations

Silva ALDA, Matias LDM and Andrade LL contributed to the conception and design, analysis and interpretation of data, writing of the article and relevant critical review of the intellectual content. Freitas JMS collaborated with a relevant critical review of intellectual content. Costa MML assisted in the relevant critical review of the intellectual content and final approval of the version to be published.

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