

# The Relationship of Psychological Stress on Diabetic Wound Healing Processes: A Literature Review

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## Abstract

Psychological stress is a component that affects the healing process of wounds. Delayed wound healing extends the duration of stay and causes anguish, resulting in financial and emotional losses. The goal of this review was to examine the psychological stress response to diabetic ulcer healing. Numerous databases were used throughout the search process, including PUBMED, PROQUEST, ScienceDirect, and SCHOLAR. Results: Psychological stress had a substantial effect on the pace of wound healing in diabetes patients. Different forms of stress were evaluated, including depression, psychological stress, and oxidative stress. Stress levels were determined using a questionnaire that examined both stress and anxiety, as well as biomarkers of stress. Wound healing was assessed using computerized measurements depending on the severity of infection. Conclusion: Psychological stress retards wound healing and lengthens hospital stay. It resulted in financial and psychological distress. As a result, health care providers are required to pay more attention to the psychological well-being of diabetes patients.

**Keywords:** psychological stress, anxiety, depression, diabetic wound healing.

## INTRODUCTION

In 2017, 425 million people around the world had diabetes mellitus (DM), and that number is expected to rise to 629 million by 2045. (1). People around the world had diabetes at 6.4%, but in North America, it was 13.3%. People with DM were more likely to be male than people with DM were. DM, which is a long-term condition, is the main cause of diabetic foot ulcers (2). People who have type 2 diabetes (DM) are more likely to get diabetic foot ulcers than people who have type 1 diabetes (DM) (3). The ulcers on the feet of people with diabetes also took longer to heal and were more likely to become infected (4).

Infection, age, sex, hormones, stress, diabetes, obesity, medications, alcoholism, smoking, and diet can all slow down the healing process of a wound (5). Due to the increased levels of various hormones in the blood, such as cortisol, aldosterone, and adrenaline in patients who have had injuries, it will take longer to recover than patients who have experienced stress (6). Chronic wounds or wounds that heal slowly are almost often the results of psychological stress or sadness (7).

Unpleasant pressure, tension, and external force were described as the causes of psychological stress (8). There are several indicators of psychological stress, including stress, anxiety, and depressive disorders. Anxiety and unpleasant sentiments interfere with daily activities, increase the risk of infection, and delay wound healing if they persist over time (9). Stress causes the hypothalamus-pituitary-adrenal (HPA) and sympathetic adrenal medullary (SAM), resulting in delayed wound healing. It lowered the amount of wound-healing-promoting cytokines produced (10). Due to delayed wound healing, patients are forced to remain longer, suffer more pain, and miss out on work and family time (10,11).

## Methods

Diabetes wounds heal more slowly if there is a high level of psychological stress. In the previous ten years, journals published in English and Indonesian were included in the search using many databases, including PUBMED, PROQUEST, ScienceDirect, and SCHOLAR. The inclusion criteria were journals published in English and Indonesian between 2008 and 2018. The titles and abstracts of 633 articles were provided. According to the article's title, there were 625 items re-selected (n = 8). Six hundred

twenty reports were discarded due to the following reasons: publication dates older than ten years, non-research articles, animal studies, and articles focusing solely on the treatment of painful wounds were all disregarded; five pieces remained, but they did not meet our inclusion criteria; these five articles will be synthesized (figure 1 and table 1).

## Results

There were five papers that met the criteria for inclusion in the review and were used to inform our discussion of them.

### 1. Types of psychological stress.

Various forms of psychological stress were found to be present in the research that was synthesized. Initially, studies looked at the psychological stress that patients were under and measured the levels of depression, anxiety, and fear that they were feeling (12). Subsequent studies also examined the psychological stress that patients were under but only measured stress psychology and how individuals were coping (13). (16).

### 2. Research design.

Case-control study and prospective observational study were two of the research designs employed in the papers that were analyzed. Stress and healing processes in epidermal growth factors were compared between cases and controls using marker exams in case-control studies (12,14,15). Others looked at how depression affects the healing process of diabetic wounds; however, this study just looked at how stress and coping affect diabetic wounds' healing process. Time-consuming observational studies are generally completed between a few days to many weeks in length (13,16).

### 3. Instrument.

Instruments for stress measurement, biomarkers for stress, assessing wounds, and others were all mentioned in the publications. One of the tools used to gauge pressure is the CES-D, which is short for "center of epidemiology study depression," and another is called the "beck depression inventory," or the "BDI-II." When it came to evaluating patients' stress levels and their ability to cope, researchers used the Hospital Anxiety and Depression Scale to find out how people felt about being in the hospital. TOC, advanced oxidation protein products, malondialdehyde (MDA), and total oregano peroxides (TOP) were also used to measure the level of oxidative stress in the body (MDA).

Diabetes wound infections were measured by the International Diabetic Foot Working Group (IWGDF) and the Infectious Diseases Society of America (IDSA). Using computerized equipment, Smith and Nephew, London, UK, assessed the wound diameters. Additionally, the self-reported Mobility-Tiredness Scale was used to determine physical exhaustion, the Barthel index set activities of daily living (ADL), and the Numeric Pain Rating Scale assessed pain intensity.

## Discussion

We conducted this study to understand better how stress affects diabetic wound healing. Diabetes wound healing is significantly delayed by psychological stress. This is due to an elevated glucocorticoid level that has an anti-inflammatory impact on the immune system in diabetes wounds, which is generated by stress (17).

Stress and wound healing have been linked in several studies, including those conducted on animals, which also established an association between the two. One study employing the case-control study technique with 25 individuals with diabetes injuries found a significant link between HRV (a physiological stress indicator) and faster healing in diabetic wounds ( $p = 0,0000$ ). (12). A case-control study with 21 both studies studied and linked stress biomarkers to the amount of diabetic wound healing in patients with diabetic wounds and delayed healing in 90 patients with chronic diabetic wounds, and both indicated an increase in oxidative stress in both groups (14,15).

Individuals with chronic ulcers are more likely to have a higher level of conflict, according to research that examined the impact of stress on wound healing in patients with diabetic neuropathic or neurochemical foot ulcers, using a prospective observational design with 93 participants. Depressed people heal wounds at a slower rate ( $p = 0.003$ ). (13). On the other hand, a prospective observational technique was employed to study the influence of depression on the healing of infected wounds in 95 diabetic foot patients. Those who had significant excavations were shown to delay wound healing, but those who had mild depressions did not (16).

Wound healing is slowed down in patients under a lot of stress. This is in line with other research showing a strong link between stress/depression and delayed healing of diabetic wounds. Chronic wound healing may be slowed by increased glucocorticoid levels and a decreased inflammatory response caused by long-term stress (17)

Adrenal glands overproduce cortisol in stressed patients, which suppresses the immune system. Catabolism, collagen

breakdown, and the release of catecholamines, all of which contribute to slight artery vasoconstriction, have all been linked to elevated cortisol levels. There is a correlation between the incidence of injury and a rise in cortisol levels (18,19)

The most common cause of chronic harm or delayed wound healing in individuals with large wounds was psychological stress (7). A patient's psychological well-being may be adversely affected by several surgical side effects, including extended recovery and the potential for impairment (20). As the link between stress and diabetic wound healing has long been shown statistically and clinically, numerous psychological therapies are needed to help patients' psychological well-being, helping them heal their wounds faster (21).

Relaxation treatment, which has been shown to improve skin healing (22), and multi-modal distraction (DITTO TM), which is also known as multi-modal distraction methods, have all been shown to improve skin recovery and reduce anxiety in patients with burn injuries (23). Hypnosis was one of the suggested procedures that intended to alleviate the negative effects of post-operative side effects including stress/anxiety. 'Suggestive Techniques' (24).

## Conclusion

A patient's immune system is suppressed, and wound healing is slowed due to their worry, which is exacerbated by prolonged psychological stress. The wound healing process might take a long time if the pressure continues for an extended period. Wounds that take longer than expected to heal can put patients through more hardship, resulting in more medical bills and a deteriorating quality of life. As a result, patients' anxiety and stress levels should be more closely monitored by health care providers, particularly nurses.

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