



## THE INFLUENCE OF SMOKING HABITS ON THE DIABETIC ULCER HEALING PROCESS

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### ABSTRACT

Diabetic ulcers are a complication of impaired bodily function resulting from high blood glucose that occurs for a long time and is not well controlled. There is a close relationship between diabetes and an increased risk of arteriosclerosis and peripheral arterial disease. The risk increases in active smokers. Macrovascular disorders occur mainly in the infragenicular vessels (tibial and peroneal arteries). Quantitative research using cross sectional and observation on 14 grade II diabetic ulcer patients at the Kitamura Clinic Pontianak to see how smoking habits influence the wound healing process. The smoking habit is one of the main risk factors that can slow down or even inhibit the healing process of diabetic ulcers

Keywords: smoking habits; healing; diabetic ulcers

## Introduction

Diabetic ulcers are a complication of impaired bodily function resulting from high blood glucose that occurs for a long time and is not well controlled.<sup>1</sup>Diabetes Mellitus is a condition of excess glucose levels in the body accompanied by metabolic abnormalities due to hormonal disorders and can cause various chronic complications. Diabetes mellitus is also a chronic or incurable disease.<sup>2</sup>Diabetic ulcers are one of the chronic complications of diabetes mellitus. Diabetic ulcers are open wounds on the skin layer down to the dermis. Diabetic ulcers occur due to blockages in the blood vessels in the legs and peripheral neuropathy due to high blood sugar levels so that the patient is not aware of the wound.<sup>3</sup>

There is a close relationship between diabetes and an increased risk of arteriosclerosis and peripheral arterial disease. The risk increases in active smokers. Macrovascular disorders occur mainly in the infragenicular vessels (tibial and peroneal arteries). Therefore, ischemic wounds contribute to the emergence of persistent foot wounds in diabetes patients. Blood vessel disorders result in blockage of blood vessels, thereby obstructing blood flow, disrupting the supply of oxygen, food or antibiotics which can interfere with the wound healing process. If the treatment for this infection is incomplete, it can cause gangrene.<sup>4</sup>

Some of the impacts of smoking on the healing process of diabetic ulcers are because the nicotine and carbon monoxide in cigarette smoke can damage blood vessels and disrupt blood flow to the legs. This makes it difficult for wounds to get the oxygen and nutrients they need to heal. Smoking weakens the immune system, making it more difficult for the body to fight infections in wounds. Infection can slow wound healing and increase the risk of complications.<sup>5</sup>Chemicals in cigarette smoke can inhibit the production of collagen, an important protein needed for wound healing. Lack of collagen can make

wounds more fragile and tear easily. Cigarette smoke contains free radicals which can increase oxidative stress in body cells. Oxidative stress can damage cells and tissue, thereby slowing wound healing. Wounds in smokers usually take longer to heal than wounds in non-smokers. Smokers are at greater risk of complications from diabetic ulcers, such as infection, amputation and death.<sup>5</sup>

## Methods

This research is a quantitative research with cross sectional and observation methods. Researchers studied smoking habits in patients who had grade II diabetic ulcers with normal leukocyte levels and blood glucose <250 mg/dl through interviews and observed the wound healing process for 14 days using the Bates-Jensen Wound Assessment Tool (BWAT) form. There were 14 respondents at the PKU Muhammadiyah Kitamura Pontianak Wound, Stoma and Incontinence Specialist Clinic who received wound care with modern dressings such as Aquacell, Calcium-Alginate, Cutimed Sorbact, Powder Iodosorp and Dalethyne. Data were analyzed using the SPSS 24 computer program.

## Results and Discussion

The research results are presented in the table below.

**Table 1. Bates-Jensen Wound Assessment Tool (BWAT) Score for Grade II Diabetic Ulcer Healing Process**

Smoking habit	Pre Test	Post Test	Post Test	Post Test	Post Test	Pre Test – Post Test
		I	II	III	IV	
Yes (n=8)	33.0 0	33.0 0	31.2 0	29.6 0	28.0 0	5
No (n=6)	36.1 1	35.5 6	34.1 1	30.8 9	28.0 0	8,11

**Table 2. Analysis of the Effect of Smoking Habits on the Healing Process of Grade II Diabetic Ulcers**

Factors	Wound healing			
	P	r	OR	CI 95%
<b>Smoking habit</b>				
Yes	0.0464	0.447		0.035 –
No	0.0335	-	0.286	2.322
		0.290		

From the results presented in table 2, it was found that smoking habits influence the healing process of grade II diabetic ulcers.

Cigarettes have a very big role in the wound healing process, this is in line with Amelia's statement that there is a significant relationship between smoking habits and the ABPI value ( $p=0.002$ ), the ABPI value describes the condition of blood vessel circulation in the lower extremities which greatly influences the wound healing process.<sup>5</sup>

Smoking can limit the blood supply through the blood vessels, causing platelet aggregation and clot formation. Carbon monoxide gas (CO), which is a residue from cigarettes, has the ability to bind hemoglobin (Hb) contained in red blood cells (erythrocytes) more strongly than oxygen, so that every time there is cigarette smoke, the oxygen level in the air is already low, and more red blood cells will there is an increasing lack of oxygen, because what is transported is CO and not oxygen.<sup>6</sup>

Body cells that suffer from a lack of oxygen will try to increase oxygen intake through blood vessel compensation, where the blood vessels will shrink or spasm. If the spasm process lasts for a long time and continuously, the blood vessels will easily be damaged with the process of arteriosclerosis (narrowing) occurring everywhere. This

situation greatly affects the health of blood vessels.<sup>7</sup>

From the results of this study, 70% of respondents had blood vessel comorbidities such as hypertension, stroke and hyperlipidemia. Blood pressure >130/80 mmHg causes decreased blood flow in the legs, due to high blood viscosity, but also causes lesions on the endothelium. This endothelial damage affects macroangiopathy through the process of platelet aggregation which results in vascular deficiency, thereby causing tissue hypoxia. This decrease in blood flow also causes the nutrients and active substances contained in the antibiotics taken by the patient to not reach the lower extremities, causing the effect of the drug and nutritional fulfillment to not be optimal, which makes the wound healing process slow.<sup>8</sup>

### Conclusion

The smoking habit is one of the main risk factors that can slow down or even inhibit the healing process of diabetic ulcers. This is caused by several reasons, namely the nicotine and carbon monoxide in cigarette smoke can damage blood vessels and disrupt blood flow to the legs, making it difficult for wounds to get the oxygen and nutrients they need to heal. Smoking also weakens the immune system, making it more difficult for the body to fight infections in wounds. Chemicals in cigarette smoke can inhibit the production of collagen, an important protein needed for wound healing.

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