



Determinants of diabetic ulcer prevention behavior among patients with diabetes mellitus: Application of the theory of planned behavior

Sholihin Solihin ^{1*} 
Eva Luthfiyatun Nadhifah ¹
Novita Surya Putri ² 

¹ Bachelor of Nursing Study Program,
STIKES Banyuwangi, Banyuwangi,
Indonesia

² Diploma 3 in Nursing, STIKES
Banyuwangi, Banyuwangi, Indonesia

*Correspondence:
Sholihin Solihin

Bachelor of Nursing Study Program,
STIKES Banyuwangi, Banyuwangi,
Indonesia
Email: [sholihin@stikesbanyuwangi.
ac.id](mailto:sholihin@stikesbanyuwangi.ac.id)

Volume 4(1), 33-40
© The Author(s) 2025
<http://dx.doi.org/10.55048/jpns149>

e-ISSN 2827-8100
p-ISSN 2827-8496

Received : August 11, 2024
Revised : December 22, 2024
Accepted : January 8, 2025
Published : January 15, 2025



This is an **Open Access** article distributed under the terms of the [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/).

ABSTRACT

Background: Diabetic ulcer is a common and serious complication of diabetes mellitus (DM), often leading to disability and reduced quality of life. Its incidence increases when patients lack adequate knowledge and skills for prevention. Understanding the behavioral determinants of ulcer prevention is essential for targeted nursing interventions.

Objective: To identify determinants of diabetic ulcer prevention behavior among patients with DM based on the Theory of Planned Behavior (TPB).

Methods: This cross-sectional study involved 39 patients with DM enrolled in the Puskesmas Klatak Prolanis program, selected through purposive sampling. Data were collected using a TPB-based questionnaire adapted to diabetic ulcer prevention indicators, encompassing attitudes, subjective norms, perceived behavioral control, intentions, and preventive behaviors. Data analysis was performed using Chi-square tests in IBM SPSS 23, with a significance level of $\alpha = 0.05$.

Results: Most respondents demonstrated positive attitudes (56.4%), low subjective norms (56.4%), low perceived behavioral control (56.4%), and low intentions (53.8%). Preventive behavior was predominantly in the fair category (69.2%). Chi-square analysis revealed significant associations between preventive behavior and attitudes ($p = 0.004$), subjective norms ($p = 0.025$), perceived behavioral control ($p = 0.028$), and intentions ($p = 0.046$).

Conclusion: Attitudes, subjective norms, perceived behavioral control, and intentions significantly influence diabetic ulcer prevention behaviors in patients with DM. Nursing interventions should integrate TPB-based strategies to strengthen positive attitudes, enhance perceived control, and foster supportive social environments, thereby improving preventive practices. Routine early detection of diabetic ulcer signs should be prioritized to reduce the risk of severe complications.

Keywords: diabetes mellitus; diabetic ulcer; prevention; theory planned behavior

Nursing and Healthcare Practices

- *Diabetes patients should receive education on how to prevent diabetic ulcers, with an emphasis on understanding the influence of attitudes, subjective norms, and perceived self-control as determinants of prevention behavior.*
- *The study highlights the importance of patients' intentions in preventing diabetic ulcers, with findings suggesting that positive intentions significantly correlate with improved behavior, underscoring the need for tailored interventions that focus on fostering strong preventive intentions.*
- *Incorporating the Theory of Planned Behavior in nursing and healthcare practices can improve patient adherence to diabetic ulcer prevention measures by addressing key factors such as attitudes, perceived control, and social norms.*

INTRODUCTION

Diabetes mellitus (DM) is a major non-communicable disease and a serious global health problem, contributing significantly to morbidity and mortality. Globally, DM accounts for an estimated 7.5 million deaths annually, with approximately 76% of these deaths attributed to the disease ([Hiadayatus Sya'diyah et al., 2020](#)). In 2021, there were 536.6 million people living with type 2 diabetes worldwide, and this number is projected to rise to 642.8 million by 2030 ([IDF, 2023](#)).

In Indonesia, the prevalence and incidence of DM have increased steadily. According to the International Diabetes Federation, the number of cases rose from 7.3 million in 2011 to 19.5 million in 2021 and is expected to reach 23.3 million by 2030. The prevalence increased from 5.7% in 2007 to 6.9% in 2013, or approximately 9.1 million people ([Kemenkes, 2023](#)). Indonesia currently ranks fifth globally in DM cases, with more than 10 million people diagnosed and 17.9 million at risk. East Java Province ranks ninth nationally, with a prevalence of 6.8% ([Riskseddas, 2018](#)).

One of the most common chronic

complications of DM is diabetic ulcer, affecting an estimated 19–34% of patients during their lifetime ([Utia Detty et al., 2020](#)). Inadequate preventive behavior is a major contributing factor. [Oktorina et al. \(2019\)](#) reported that 27.1% of patients demonstrated poor prevention practices, with 91.43% failing to perform proper nail-cutting techniques. Preliminary observations in the Puskesmas Klatak Prolanis program (June 2024) revealed that among 10 patients assessed, five had poor preventive behaviors. Puskesmas (an acronym for Pusat Kesehatan Masyarakat, or Community Health Center) is a government-funded primary healthcare facility in Indonesia that delivers preventive, promotive, curative, and rehabilitative health services to the community at the subdistrict level.

Preventive measures, including early detection and patient education, are essential. Several factors—such as education, disease history, knowledge, self-awareness, and self-care—affect prevention efforts ([Hanggayu Pangestika et al., 2022](#)). The Theory of Planned Behavior (TPB) offers a framework for understanding these determinants by examining attitudes, subjective norms, and perceived behavioral control, which collectively shape intentions and preventive actions ([Sukartini et al., 2020](#)). Integrating TPB into nursing practice may strengthen patient motivation and adherence to diabetic ulcer prevention strategies. Therefore, this study aimed to identify the determinants of diabetic ulcer prevention behavior among patients with DM based on the Theory of Planned Behavior in the working area of Puskesmas Klatak in 2024.

METHODS

Design

This study employed a quantitative research design using a cross-sectional approach, in which data on both exposures (independent variables) and outcomes (dependent variables) were collected and measured at a single point in time. The cross-sectional design allows for the identification of associations between variables without manipulating study conditions, making it suitable for assessing the prevalence of certain behaviors and their related factors within a specific population. In this context, the design was selected to examine the relationship between attitudes, subjective norms, perceived

behavioral control, and intentions with diabetic ulcer prevention behavior among patients with diabetes mellitus. As described by Maninder Singh Setia (2019), cross-sectional studies provide a snapshot of the population at a given moment, enabling researchers to explore potential correlations and generate hypotheses for further longitudinal or experimental research.

Sample and setting

The study was conducted in the working area of Puskesmas Klatak, Banyuwangi, on 6 September 2024. A purposive sampling technique was employed to select participants from the target population based on predefined eligibility criteria. This non-probability sampling method was chosen to ensure that participants met the specific characteristics required for the study objectives. The inclusion criteria were: (1) patients diagnosed with diabetes mellitus (DM) aged 18–65 years, (2) able to read and write, (3) willing to participate as respondents, and (4) actively participating in the Prolanis (Chronic Disease Management Program) activities. The exclusion criteria were: (1) patients with psychiatric or hearing disorders and (2) patients with DM who had an active diabetic ulcer at the time of data collection. The study population consisted of 42 DM patients enrolled in the Prolanis program at Puskesmas Klatak. Applying the purposive sampling criteria resulted in a final sample of 39 eligible participants.

Variable

The independent variables in this study were attitudes, subjective norms, perceived behavioral control, and intentions, as conceptualized within the Theory of Planned Behavior framework. The dependent variable was diabetic ulcer prevention behavior, which encompassed patients' actions and practices aimed at reducing the risk of developing diabetic ulcers.

Instrument

Data were collected through self-administered questionnaires distributed to all eligible respondents. The first part of the questionnaire gathered demographic information, including age, gender, education level, duration of diabetes, and type of medication used. The second part assessed attitudes toward behavior, subjective norms, perceived behavioral control,

intentions, and diabetic ulcer prevention behavior, using the Theory of Planned Behavior (TPB) questionnaire adapted from Sukartini et al. (2020). The original instrument was modified to align with specific diabetic ulcer prevention indicators, ensuring content relevance to the study context.

Data Collection

Data were collected by distributing questionnaires to all eligible respondents. The first section of the questionnaire obtained demographic information, while the second section assessed attitudes toward behavior, subjective norms, perceived behavioral control, intentions, and diabetic ulcer prevention behavior using a Theory of Planned Behavior (TPB)-based instrument adapted from Sukartini et al. (2020) to include indicators specific to ulcer prevention. Upon completion, all questionnaires were reviewed (editing) to ensure completeness of responses. Each response was then assigned a code (coding), scored according to the measurement scale (scoring), and organized into categories for analysis (tabulating) using IBM SPSS version 23. The presentation of research findings was divided into two sections: (1) general data, consisting of demographic characteristics of the sample, and (2) specific data, consisting of scores for attitudes, subjective norms, perceived behavioral control, intentions, and diabetic ulcer prevention behavior.

Data analysis

In this study, quantitative data analysis was conducted using the Chi-square test to examine the association between independent and dependent variables. A significance level of $\alpha = 0.05$ (5%) was applied to determine statistical significance. The primary aim of the analysis was to identify factors associated with diabetic ulcer prevention behavior based on the Theory of Planned Behavior framework.

Ethical consideration

This research was conducted on Friday, September 6, 2024, at Puskesmas Klatak. Ethical approval was obtained from the Health Research Ethics Committee (Komite Etik Penelitian Kesehatan, KEPK) of Stikes Banyuwangi, with ethical clearance certificate number 318/01/KEPK-STIKESBWI/VII/2024.

Tabel 1. Distribution responden (n=39)

Variable	n	%
Gender		
Male	8	20.5
Female	31	79.5
Age		
23-35 years	1	2.6
36-45 years	0	0
46-55 years	14	35.9
56-65 years	24	61.5
Education		
Elementary School	20	51.3
Junior High School	6	15.4
Senior High School	7	17.9
Universities	6	15.4
Length of DM		
<5 years	23	59.0
5-10 years	15	38.5
>10 years	1	2.6
Type of drugs used		
Metformin	3	7.7
Glimepiride	35	89.7
Insulin	1	2.6
Attitude		
Positive	22	56.4
Negative	17	43.6
Subjective Norms		
Good	17	43.6
Less	22	56.4
Perceived Behavioral Control		
Good	17	43.6
Less	22	56.4
Intention		
Good	18	46.2
Less	21	53.8
Diabetic Ulcer Prevention Behavioral		
Good	8	20.5
Fair	27	69.2
Less	4	10.3

Table 2. Result of analysis

Influence	T	Significance (2-tiled)
X1→Y1	25.503	0.004
X2→Y1	11.112	0.025
X3→Y1	20.137	0.028
X4→Y1	6.139	0.026

X1: Attention; X2: Subjective norms; X3: Perceived behavioral control; X4: Intention; Y1:Diabetic ulcer prevention behavioral

RESULTS

Most respondents were female ($n = 31$; 79.5%), with more than half aged 56–65 years ($n = 24$; 61.5%). Over half of the participants had completed only elementary school ($n = 20$; 51.3%). The majority had been diagnosed with diabetes for less than five years ($n = 23$; 59%). Regarding medication use, most respondents reported taking glimepiride ($n = 35$; 89.7%). In terms of behavioral determinants, more than half demonstrated a positive attitude toward diabetic ulcer prevention ($n = 22$; 56.4%). However, the majority had low perceived behavioral control ($n = 22$; 56.4%) and low intentions to engage in preventive practices ($n = 21$; 53.8%). For overall diabetic ulcer prevention behavior, most respondents were categorized as fair ($n = 27$; 69.2%) (Table 1).

Table 2 demonstrates significant associations between several independent variables and diabetic ulcer prevention behavior. The analysis produced four key findings: (1) a significant relationship between attitude and diabetic ulcer prevention behavior ($T = 25.503$, $p = 0.004$), (2) a significant relationship between subjective norms and diabetic ulcer prevention behavior ($T = 11.112$, $p = 0.025$), (3) a significant relationship between perceived behavioral control and diabetic ulcer prevention behavior ($T = 20.137$, $p = 0.028$), and (4) a significant relationship between intention and diabetic ulcer prevention behavior ($T = 6.139$, $p = 0.026$). All associations were significant at $\alpha = 0.05$.

DISCUSSION

Relationship between attitude and diabetic ulcer prevention behavior

The results of the Chi-square test in this study demonstrated a p-value of 0.004 ($\alpha < 0.05$), indicating a statistically significant relationship between attitude and diabetic ulcer prevention

behavior among patients with diabetes mellitus. This finding is consistent with the study by Sukmawati (2021), which reported a similar significant association ($p = 0.016$) between attitude and preventive behavior in patients with type II diabetes mellitus at Pengasinan Health Center. In the present study, a notable trend was observed wherein respondents with positive attitudes were more likely to exhibit moderate preventive behaviors, as seen in 32 respondents, suggesting that a favorable mindset may promote adherence to preventive measures. These findings are further supported by Sofyanti et al. (2022), who found that among 39 respondents with positive attitudes toward ulcer prevention, 25 demonstrated good preventive behaviors, whereas among 44 respondents with negative attitudes, 30 displayed poor preventive behaviors. This evidence reinforces the principle within Green's behavioral theory, as described by Huda Nuril and Albushairi Siti (2020), which posits that attitudes play a pivotal role in shaping an individual's behavior, especially in health-seeking contexts. A positive attitude may enhance motivation, foster awareness, and strengthen commitment to preventive actions, whereas a negative attitude may result in neglect or inconsistency in health-related practices. In the context of diabetic ulcer prevention, patients with positive attitudes are more likely to appreciate the importance of routine foot care, regular monitoring, and early detection of ulcer signs, thereby reducing the risk of complications. Conversely, those with negative attitudes may undervalue these preventive measures, potentially increasing their susceptibility to ulcer development and progression.

Relationship between subjective norms and diabetic ulcer prevention behavior

The analysis in this study revealed a p-value

of 0.025 ($\alpha < 0.05$), indicating a statistically significant relationship between subjective norms and diabetic ulcer prevention behavior among patients with diabetes mellitus. This suggests that social influences—such as encouragement from family, peers, and healthcare providers—play a critical role in shaping preventive practices. Similar findings were reported in previous research, which showed a strong influence of subjective norms on foot care behavior in diabetic patients, with a p-value of 0.001, indicating that individuals embedded in supportive home environments and who receive consistent advice from health services are more likely to engage in preventive foot care. Gani also emphasizes that individuals' behaviors are shaped by those around them, as people tend to adopt practices endorsed or modeled by their social network. Sakitri et al. (2020) further highlight that social opinion and support can significantly influence an individual's willingness to adopt healthy behaviors; frequent encouragement from family and friends can enhance openness and motivation to maintain health. However, it is important to note that not all external influences result in positive behavior change. Factors such as personal experiences, cultural norms, and exposure to mass media can modify or even counteract the intended influence of supportive social networks. In the context of diabetic ulcer prevention, strong and consistent subjective norms may reinforce adherence to preventive measures such as regular foot inspection, proper hygiene, and early reporting of abnormalities, whereas weak or negative norms may contribute to neglect of such practices, increasing the risk of ulcer formation and progression.

Relationship between perceived behavioral control and diabetic ulcer prevention behavior

The results of this study showed a p-value of 0.028 ($\alpha < 0.05$), indicating a significant relationship between perceived behavioral control and diabetic ulcer prevention behavior among patients with diabetes mellitus. Perceived behavioral control, often conceptualized as self-efficacy, reflects an individual's belief in their capacity to perform specific behaviors and the perceived ease or difficulty of doing so. In the context of diabetic ulcer prevention,

higher perceived control is likely to encourage consistent engagement in preventive practices such as regular foot inspection, proper hygiene, and prompt management of early signs of complications. Personal motivation plays an important role in enhancing perceived control, which in turn contributes to a more positive attitude toward ulcer prevention. The findings of this study align with those of Novita Yohana (2019), who reported a significant association ($p = 0.001$) between perceived behavioral control and foot care behavior in patients with DM, noting that individuals with strong self-efficacy were more diligent in implementing preventive measures. A high level of perceived behavioral control not only increases motivation but also boosts self-confidence, reinforcing the belief that preventive actions can yield positive health outcomes. Conversely, individuals with low perceived behavioral control may feel less capable of implementing necessary preventive measures, potentially leading to inconsistent or inadequate foot care practices. Strengthening perceived behavioral control through targeted education, skill-building, and resource provision could therefore be a key strategy for nurses and healthcare providers to enhance diabetic ulcer prevention behaviors in this patient population.

Relationship between intention and diabetic ulcer prevention behavior

The findings of this study indicated a p-value of 0.046 ($\alpha < 0.05$), demonstrating a significant relationship between intention and diabetic ulcer prevention behavior among patients with diabetes mellitus. Within the Theory of Planned Behavior framework, intention is regarded as the immediate precursor to action, reflecting an individual's motivation and commitment to perform a specific behavior. In the context of ulcer prevention, a strong intention drives patients to engage in consistent foot care practices, routine inspection, and early detection of potential problems. This aligns with the perspective of Hsieh et al. (2019), who emphasized that higher intention levels are associated with better adherence to disease management behaviors in patients with DM. Motivation plays a critical role in shaping these intentions, as motivated individuals are more likely to translate preventive knowledge into consistent action. According to the Centers for Disease Control and Prevention (CDC), regular foot care can reduce the incidence of diabetic foot disease by 50–60%, thereby significantly

improving patients' quality of life. Similarly, Dedi et al. (2024) highlighted the necessity of fostering strong intentions to maintain effective foot care routines. The present findings reinforce that individuals with a high intention to prevent diabetic ulcers are more likely to consistently engage in protective behaviors, whereas low intention may lead to irregular or insufficient preventive measures, increasing the risk of ulcer development. Therefore, nursing interventions aimed at strengthening patients' intentions—through motivational counseling, goal setting, and reinforcement strategies—are essential to improving diabetic ulcer prevention outcomes.

CONCLUSION

This study demonstrated that attitudes, subjective norms, perceived behavioral control, and intentions—core constructs of the Theory of Planned Behavior—are significant determinants of diabetic ulcer prevention behavior among patients with diabetes mellitus. Positive attitudes, strong social support, higher confidence in self-care abilities, and firm intentions were all associated with better preventive practices. These findings emphasize that ulcer prevention is not solely dependent on clinical knowledge, but also on behavioral and psychosocial factors that shape patient actions. Early detection and consistent foot care are critical in reducing the risk of ulcer development, preventing complications, and improving quality of life.

The results of this study provide valuable guidance for nursing practice. Nurses should design and implement educational programs that not only increase knowledge of diabetic ulcer prevention but also address behavioral determinants. Interventions should aim to: (1) foster positive attitudes by highlighting the benefits and outcomes of preventive behaviors, (2) engage family members and community support systems to strengthen subjective norms, (3) build patients' confidence in performing preventive measures through skills training and practical demonstrations, and (4) enhance intentions by setting achievable self-care goals and providing regular feedback. Incorporating the Theory of Planned Behavior into nursing interventions can improve patient adherence to preventive practices, ultimately reducing ulcer incidence and associated healthcare burdens. Furthermore, routine foot assessments should be integrated into primary

care visits, and community health programs should actively promote self-monitoring behaviors among individuals with diabetes.

Declaration of Interest

The authors declare that no conflicts of interest exist.

Acknowledgment

None

Funding

None

Data Availability

None

REFERENCES

- Dedi, O., Tarihoran, M., Samosir, B., & Husada, S. N. (2024). Hubungan antara foot self care dan neuropati perifer pada diabetes melitus di wilayah kerja Puskesmas Poriaha Kabupaten Tapanuli Tengah 2023. *JCI Jurnal Cakrawala Ilmiah*, 3(12). <http://bajangjournal.com/index.php/JCI>
- Detty, A., Fitriyani, N., Prasetya, T., & Florentina, B. (2020). Karakteristik ulkus diabetikum pada penderita diabetes melitus. *Juni*, 11(1), 258–264.
- Hidayatus Sya'diyah, H., Mei, D., Kertapati, Y., & Ismail, A. (2020). Penyuluhan kesehatan diabetes mellitus: Penatalaksanaan dan aplikasi senam kaki pada lansia di wilayah pesisir Surabaya. *Pengabdian Masyarakat*, 3(1).
- Hsieh, Y. L., Lee, F. H., Chen, C. L., Chang, M. F., & Han, P. H. (2019). Factors influencing intention to receive examination of diabetes complications. *Asian Nursing Research*, 10(4), 289–294. <https://doi.org/10.1016/j.anr.2016.10.004>
- Huda, N., & Albushairi, S. (2020). Model green purchase behavior berbasis theory of planned behavior (TPB). *Jurnal Sains Manajemen dan Kewirausahaan*, 2(1), 22–31.
- Maninder, S. S. (2019). Seri metodologi modul 3: Studi cross-sectional. *National Library of Medicine*, 61(3), 261–264.
- Novitasari, Y. S. (2019). *Pengaruh sikap, norma, dan persepsi kontrol terhadap perilaku perawatan kaki pada penderita diabetes melitus di Puskesmas wilayah Kota Surabaya Selatan* [Doctoral dissertation, STIKes Hang Tuah Surabaya].

- Oktorina, R., Wahyuni, A., & Harahap, E. Y. (2019). Pencegahan ulkus diabetikum pada penderita diabetes mellitus. *REAL in Nursing Journal (RNJ)*, 2(3), 108–117. <https://ojs.fdk.ac.id/index.php/Nursing/index>
- Pangestika, H., Ekawati, D., & Murni, N. S. (2022). Faktor-faktor yang berhubungan dengan kejadian diabetes mellitus tipe 2. *Jurnal 'Aisyiyah Medika*, 7(1), 27–31.
- Rahmanita, R., Alamsyah, M. S., & Mulyadi, E. (2024). Hubungan perawatan kaki dengan risiko kejadian ulkus kaki diabetik pada penderita diabetes melitus di wilayah kerja Puskesmas Sukabumi. *Jurnal Ilmu Keperawatan dan Kebidanan*, 2.
- Sakitri, G., Kusuma, R., Diii, A., Husada, K. A., Diii, S., & Surakarta, I. H. (2020). Strategi kontrol gula darah dengan theory of planned behaviour pada pasien diabetes mellitus tipe 2 di Puskesmas Stabelan. *PROFESI (Profesional Islam) Media Publikasi Penelitian*, 18(1).
- Setiawan, Y., Sanjaya, L. R., Armi, A., Studi, P., Keperawatan, S., Pendidikan, D., Ners, P., & Kesehatan, I. (2023). Gerak SKM (senam kaki musik) untuk diabetes melitus sebagai pengembangan promotif dan preventif bersama kader kesehatan di Puskesmas Cikarang tahun 2022. *BERNAS: Jurnal Pengabdian Kepada Masyarakat*, 4(4), 3284–3289. <https://doi.org/10.31949/jb.v4i4.6918>
- Sofyanti, N. D., Naziyah, N., & Hidayat, R. (2022). Hubungan pengetahuan dan sikap terhadap upaya pencegahan ulkus diabetikum pada penderita diabetes melitus tipe 2 di Puskesmas Kecamatan Pancoran Jakarta Selatan. *Malahayati Nursing Journal*, 4(3), 663–672. <https://doi.org/10.33024/mnj.v4i3.6071>
- Sukartini, T., Dee, T. M. T., Probawati, R., & Arifin, H. (2020). Behaviour model for diabetic ulcer prevention. *Journal of Diabetes and Metabolic Disorders*, 19(1), 135–143. <https://doi.org/10.1007/s40200-019-00484-1>
- Sukmawati, P. F. (2021). Hubungan pengetahuan dan sikap dengan perilaku pencegahan ulkus diabetikum pada penderita diabetes melitus tipe 2 di Puskesmas Pengasinan Kota Depok. *Indonesia Enterostomal Therapy Journal*, 1(1).
- Susilawati, E., Lestari, Y. P., Nurrika, D., & Puspitasari, D. (2024). Pengaruh edukasi digital tentang perawatan kaki terhadap niat perilaku pencegahan luka kaki pasien diabetes melitus. *Jurnal Untuk Masyarakat Sehat (JUKMAS)*, 8(1). <http://ejournal.urindo.ac.id/index.php/jukmas>