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Determinants of diabetic wound healing in patients at the Cipadu Community Health Center, Tangerang City

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ABSTRACT

Diabetes mellitus (DM) is a common chronic disease with serious complications including diabetic wounds. DM complications result in chronic wounds that require specialized care and considerable time. The prevalence of diabetic wounds continues to increase globally, including in Indonesia, where this complication accounts for the majority of lower limb amputation cases. To know the determinants of wound care on the healing of diabetes in patients at Cipadu Community Health Center. This study uses a cross-sectional study design by collecting medical record data from DM patients who underwent treatment or care at Cipadu Community Health Center from January 2022 to December 2022. There are 65 patients in the study population who met the inclusion and exclusion criteria. The data were analyzed descriptively using statistical methods such as the chi-square test and logistic regression to identify relationships between variables. The study results show that a regular wound care schedule and a combination of modern traditional wound care have significant effectiveness in the healing process of diabetic ulcers. Multivariate analysis revealed that wound care is the healing of diabetic wounds while the wound care schedule is a control variable. Factors such as age, gender, and wound stage did not show a significant relationship with wound healing.

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INTRODUCTION

The integumentary system has a very important role in protecting the body from external dangers (S. Agustina & Khiong, 2023)(Migliozzi, 2022). However, wounds that often occur in everyday life can damage the system and have an impact on health. Wounds according to Arinigrum (2018) are events that disrupt the continuity of body tissue caused by physical, mechanical, and thermal effects (Dewi et al., 2022)(Humaidah, 2021). Wounds are classified into two, namely acute and chronic wounds. Acute wounds are wounds whose healing process is less than 3 months according to physiology, while chronic wounds are wounds whose healing process ranges from four to six weeks or even more (Wintoko, 2020). One of the chronic wounds is diabetic wounds (Saputra, 2023)(Hidayat et al., 2024).

Diabetic wounds are open wounds on the surface of the skin to the dermis. This complication occurs due to hyperglycemia and neuropathy which cause various changes in the skin and muscles so that there is an imbalance in the distribution of pressure on the soles of the feet which will facilitate the occurrence of wounds (Mardiyono et al., 2019)(Arifin & Kurnia, 2022). Diabetic wounds not only have physical impacts, but also psychological, social, and economic impacts. The impacts that occur on the physical of diabetic wound sufferers that arise are in the form of foot deformities, pain, infections that have the potential for amputation, and psychological disorders in the form of anxiety that can arise if diabetic wound sufferers have experienced it for years (Setiawan et al., 2020)(Siburian et al., 2021).

The incidence of diabetic wounds increases every year. This is supported by data from the International Diabetes Federation (2024) which shows that the number of diabetes sufferers in the world in 2021 reached 537 million with 19 million of them coming from Indonesia (Anggita et al., 2024)(Sri Utami, 2024). The number is predicted to continue to increase every year. Indonesia is one of the countries with the largest number of DM sufferers with diabetic wound complications in the world. The prevalence of diabetic wound sufferers in Indonesia reaches 15%, the amputation rate is 30%, and the mortality rate is 32% (Nurlany et al., 2021)(S Kep, 2024). Basic Health Research (Riskesdas) shows quite significant diabetes prevalence results, namely 6.9% in 2013 and increasing to 8.5% in 2018 so that the estimated number of sufferers in Indonesia reaches 16 million people and 4 million people are estimated to suffer from diabetic wounds (Riskesdas, 2018).

Efforts that can be done for diabetic wound sufferers include proper wound care techniques. An important role in diabetic wound care is skin and wound care, maintaining moisture, washing the wound, and choosing the right dressing.(Nurapandi et al., 2023),(Katuuk et al., 2020). Wound washing can use fluids, such as NaCl, mineral water, boiled water, and water boiled with herbal ingredients. Guava leaf decoction is one alternative for washing diabetic wounds. Guava leaf decoction contains various antimicrobials, such as essential oils, flavonoids, tannins, and alkaloids (JD Agustina, 2018)(Baidhowy et al., 2022). Guava leaves are useful as antibacterial, anti-inflammatory, analgesic, and antioxidants that can protect the skin layer. The flavonoid content in guava can reduce the number of bacteria, wound infections, and reduce exudate production which can reduce the odor that occurs in wounds (Baidhowy et al., 2022). Based on the results of a preliminary study conducted at the Cipadu Health Center, data on the number of patients undergoing diabetic treatment in 2020 was 385 people and increased in 2021 to 588 people with different characteristics. In addition, based on the results of interviews with nurses at the Cipadu Health Center, it is known that diabetic wound care has been combined with traditional modern wound care (Zulhakim et al., 2021)(Wahyudi et al., 2022).

Problem Formulation, Based on the background above, where the increasing cases of diabetic wounds in Indonesia, especially in Cipadu Health Center, which requires a special treatment approach. To overcome this serious complication, Cipadu Health Center has implemented a combination of modern and traditional treatment techniques. However, the effectiveness of this approach and the factors that influence its success still need to be studied. Therefore, this study aims to evaluate the effectiveness of the combination of treatments in reducing the physical, psychological, social, and economic impacts on patients, and to identify factors that contribute to the success of diabetic wound care.

Objective: To determine the effectiveness of modern traditional wound care on healing diabetic wounds in patients at the Cipadu Health Center.

Specific Objectives: To determine the characteristics of diabetic wound patients at Cipadu Health Center. To determine the effect of age on diabetic wound healing in patients at Cipadu Health Center.Known influence gender on diabetic wound healing in patients at Cipadu Health Center It is known that the effect of wound stage on diabetic wound healing in patients at the Cipadu Health Center. The effect of length of treatment on healing of diabetic wounds in patients at Cipadu Health Center is known. The effect of treatment schedule on healing of diabetic wounds

in patients at Cipadu Health Center is known. The effect of wound care on healing of diabetic wounds in patients at Cipadu Health Center is known.

Benefits of Research, Theoretically, the results of this research are expected to increase scientific insight into the effectiveness of the integrated modern traditional wound care system in diabetic patients and to identify the factors that influence the healing process.

RESEARCH METHOD

Types and Design of Research

This study is a quantitative study using a Cross-Sectional Study research design, namely by taking medical record data from diabetes patients who received treatment together from January 2022 to December 2022 at the Cipadu Health Center.

Place and Time of Research

This research was conducted at the Cipadu Health Center, Tangerang City. The research was conducted in January 2023.

Population and Sample

The population of this study was Diabetes patients who received treatment from January 2022 to December 2022 at the Cipadu Health Center with a total of 65 patients. The research sample was obtained from medical record data of Diabetes patients at the Cipadu Health Center. The research sample was all the population of Diabetes patients who received treatment from January 2022 to December 2022 as many as 65 patients. The sample in this study was taken according to the criteria. The criteria used include (Notoatmodjo, 2012).

a. Inclusion Criteria, inclusion criteria are criteria or characteristics that must be met by each member of the population that can be taken as a sample. Based on this theory, the inclusion criteria in the study are as follows. (a) Diabetes patients who received treatment from January 2022 to December 2022 (b) Complete medical records related to the data needed in this study.
b. Exclusion Criteria, are characteristics of population members that cannot be taken as samples. Based on this theory, the exclusion criteria in the study are incomplete medical record data related to this study.

Sampling Techniques

The sampling method uses the total sampling method (consecutive sampling).

Research Ethics

Researchers or researchers in carrying out research tasks or conducting research should uphold a scientific attitude and adhere to research ethics, even though the research conducted may not be detrimental or the author submits research approval to the Cipadu Health Center before the research is conducted. Research subject data is taken from patient medical records.

Research Instruments

Data on recovery of diabetes patients, wound care, age, gender, wound stage, duration of wound care, wound care schedule from medical record data of diabetes patients.

Data collection technique

Data collection procedures are as follows: (a) Conducting data collection on Diabetes patients who received treatment from January 2022 to December 2022 at the Cipadu Health Center, Tangerang City who met the inclusion and exclusion criteria. Recovery of diabetes patients, wound care, age, gender, wound stage, duration of wound care, wound care schedule. (n) Analyzing the data obtained

Data analysis

Basic data were processed descriptively. Estimation of the magnitude of the association of two variables with relative risk. The relationship between independent variables and related variables using the chi square test and continued with logistic regression analysis (multivariate). Statistical tests using a 95% confidence interval or a significance limit value of p <0.05. Data analysis using the SPSS 21 for Windows computer program.

RESULTS AND DISCUSSIONS

Health facilities in the Cipadu Health Center UPT Working Area are 1 main health center, 1 mobile health center car, 4 alert villages, and 46 integrated health posts. The problem faced in terms of manpower is the lack of Human Resources (HR). Efforts to meet needs are through proposing additional human resources according to needs and educational qualifications to the Tangerang City Health Office each year. The total number of Cipadu Health Center UPT employees is 30 people consisting of 12 civil servants, 18 THL.

This study has limitations that can affect the results of the study, these limitations are: (a) The study was conducted after the Covid-19 pandemic so that the data obtained was incomplete. (b) The research sample required is very limited (c) Many patients do not receive regular treatment. (c) Patients who have economic problems to receive treatment

Results

The Effect of Age on Wound Healing in Diabetic Patients

The results of the p-Value statistical test based on table 5.11 are p = 0.323> α = 0.05, so it can be said that there is no significant effect between age and wound healing of diabetic patients, that there are 40 recovered patients consisting of 27 people (67.5%) in late adulthood and 13 people (32.5%) who are elderly. And there are 25 patients who did not recover consisting of 13 people (52.0%) who are in late adulthood and 12 people (48.0%) who are elderly. So the wound healing of diabetic patients is highest in late adulthood.

In contrast to the results of research conducted by Lestari (2011), namely that 72.7% of diabetic ulcer sufferers who had longer days of treatment for wounds were in the age group over 50 years or the elderly group because the amount of skin elastin decreased and the collagen regeneration process decreased due to increasing age, that 70% of elderly diabetic ulcer sufferers experienced obstacles in healing and took longer because the quality of life of elderly diabetic ulcer sufferers was lower compared to the quality of life of young diabetic ulcer sufferers related to better physical conditions.

Meanwhile, the World Health Organization (WHO) argues that individuals over the age of 30 will experience an increase in blood glucose levels of 1-2 mg/dl during fasting and will increase by 5.6-13 mg/dl 2 hours after eating so that it can accumulate insulin in body cells that can reduce the effectiveness of substances such as proteins and other minerals in the wound healing process in diabetic ulcers. Aging causes skin cells to lose elasticity due to decreased vascularization fluid in the skin and reduced sebaceous glands which further reduce skin elasticity. Inelastic skin will reduce the ability of cell regeneration when the wound is about to close and begins to close so that it can slow down wound healing (Nugroho, 2008).

One of the reasons why the 45->90 year old age group has a higher number of diabetic ulcer sufferers compared to the 35-44 year old age group is due to aging factors. The aging process that occurs after the age of 45 will result in physiological and biochemical changes in each cell development so that it can experience a decrease in cell quality and productivity. Patients aged >45 years have a longer time in the healing process of diabetic ulcers due to decreased skin elastin and a decreased collagen regeneration process due to decreased cell productivity from before. Inelastic skin will reduce the ability

cell regeneration when the wound will and begins to close so that it can slow down wound healing and even susceptible to exposure to bacterial infections. In addition, based on Sulaiman (2012), the majority of people over 45->90 years of age have a quality of life or a decreasing level of productivity so that old age can make it difficult for people in that age group in their activities compared to young people. This study showed that late adulthood recovered more than the elderly, this is because the young have a higher level of activity than the elderly.

The Influence of Gender on Wound Healing in Diabetic Patients

The results of the p-Value statistical test based on table 5.12 are p = 0.490> α = 0.05, so it can be said that there is no significant effect between gender and wound healing of diabetic patients, that there are 40 people who have recovered consisting of 24 people (60.0%) male and 16 people (40.0%) female. And there are 25 people who did not recover consisting of 12 people (48.0%) male and 13 people (52.0%) female, so the wound healing of diabetic patients is male.

The results of this study differ from the results of a study conducted by Purwanti (2013) which stated that the incidence of diabetic ulcers was more common in women compared to men. In addition, the results of a study conducted by Diani (2013) stated that female respondents suffered from diabetic ulcers longer in healing compared to men because women were more active with their activities at home compared to men.

Viewed from a hormonal perspective, women who experience diabetic ulcers are more likely than men due to decreased estrogen hormone due to menopause. Estrogen basically functions to maintain blood sugar balance and control fat storage.(Enikmawati et al., 2024). In addition to the hormone estrogen, there is also the hormone progesterone, both of these hormones play an important role in a woman's body. Both of these hormones are steroid hormones that are responsible for various characteristics in a woman's body (Manurung, 2020)(Botutihe & KM, 2022).

In Indonesia, the average woman experiences menopause at the age of 48-50 years, while pre-menopause can occur on average 3-6 years before a woman experiences menopause or stops menstruating completely. In line with this opinion, the results of Ferawati's research (2013) state that women have more and require longer periods of time for diabetic ulcers due to a decrease in estrogen and progesterone hormones.

According to researchers, the cause of longer healing of diabetic ulcers in women is because the sex hormones in women experience a decrease in quantity, namely estrogen and progesterone. One of the functions of estrogen is to control blood sugar levels and progesterone functions to control glucose storage. When women experience menopause, these two hormones are still produced but in lower amounts than usual, thus affecting blood sugar levels. Unlike women, in men, the sex hormone, namely testosterone, does not lead to controlling blood sugar levels, but rather to muscle formation and

bone growth so it can be concluded that women have a higher risk of taking longer to heal diabetic ulcers than men.

The Influence of Wound Stage on Wound Healing in Diabetic Patients

The results of the p-Value statistical test based on table 5.12 are p = 0.104> α = 0.05, so it can be said that there is no significant effect between the wound stage and the healing of diabetic patient wounds, that there are 40 people who have recovered consisting of 24 people (60.0%) with early wound stages and 16 people (40.0%) with late wound stages. And there are 25 people consisting of 9 people (36.0%) early wound stages and 16 people (0.0%) late wound stages. So the healing of diabetic patient wounds is early stage.

The results of this study differ from the study conducted by Triyanisa (2013) that 60.6% of diabetic ulcer sufferers were stage IV. While in the study of Ferawati (2014) in the results of her study stated that patients who recovered from diabetic ulcers were the lowest level of diabetic ulcer sufferers and the majority only experienced progress in wound conditions 70% stage I could heal on time, 60% stage II could heal on time, 50% stage III could heal on time, and 40% stage IV

could heal on time. Then the study of Yunus (2013) which stated that the high number of diabetic ulcer sufferers stage III and IV was due to the lack of knowledge and attention of diabetic ulcer sufferers to immediately treat their wounds when the initial wound occurred. Most lay people prefer to leave their wounds open with the assumption that "open wounds will dry quickly and if the wound is dry it means the wound has healed". Open wounds are susceptible to friction, trauma, and even infection, thus inhibiting the healing process of diabetic ulcers and prolonging the duration of wound care.

Meanwhile, in the Wound Care Association, the time needed to heal diabetic ulcers is 2-3 weeks for stage I, 3 weeks-2 months for stage II, ≥2 months for stage III, and 3-7 months for stage IV (Irma, 2013). Although there is an estimated time in the wound healing process, it is still relative because there are still other things that affect it, such as the condition of wound hygiene, whether there is a wound infection or not, dressing changes, and the patient's regularity in carrying out wound care. The effect of the length of diabetic ulcer care on the initial wound stage factor is the diagnosed stage level, whether it is stage I-II or III-IV. Stages III to IV are stages that have a longer treatment time than stages I-II. Determining the stage of the wound at the beginning of treatment will make it easier for nurses to determine the estimated length of care and what interventions will be given.

The Effect of Length of Wound Care on Wound Healing in Diabetic Patients

The results of the p-Value statistical test based on table 5.15 are $p = 0.173 > \alpha = 0.05$, so it can be concluded that there is no significant effect between the length of wound care and wound healing of diabetic patients, that there are 40 recovered patients consisting of 21 people (52.5%) with a wound care duration of 1-24 weeks and 19 people (47.5%) with a wound care duration of 25-48 weeks and 25 people who did not recover consisting of 8 people (32.0%) with a treatment duration of 1-24 weeks and 17 people (68.0%) with a treatment duration of 25-48 weeks.

This study is supported by Ifa Rofiah's research (2016) that some respondents have suffered from diabetes for 5-10 years as many as 43 respondents (53.1%). This shows that respondents have suffered from hereditary disease for a long time and some are obtained because respondents are still unable to carry out diabetes care properly. In line with the results of Utami's research (2014) which stated that the majority of respondents have suffered from the disease for ≥10 years, this is influenced by poor lifestyle and diet control.

Meanwhile, Lavery et al. (2008) reported on the possibility of healing diabetic ulcers based on the percentage of ulcer area reduction. Ulcers that achieve an area reduction of ≥15% in the first week have a 68% chance of healing, or if the ulcer area reduction is ≥60% in the fourth week, have a 77% chance of healing. The magnitude of the change in ulcer area at the beginning of the first week of treatment can estimate the possibility of healing in the 16th week, and can rationally determine to re-evaluate the ulcer and change the type of therapy.

The Effect of Wound Care Schedule on Wound Healing in Diabetic Patients

The results of the p-Value statistical test based on table 5.15 are $p = 0.043 > \alpha = 0.05$, it can be concluded that there is a significant influence between the wound care schedule and the healing of diabetic patient wounds, that there are 40 people who recovered consisting of 26 people (65.0%) with a regular wound care schedule and 14 people (35.0%) with an irregular wound care schedule. And there are 25 people who did not recover consisting of people (36.0%) with an irregular wound care schedule and 16 people (64.0%) with an irregular wound care schedule. Based on these results, if the wound care schedule is more regular, it will increase the healing of diabetic patient wounds by 4.105 times.

In line with the results of research conducted by Ferawati (2014), in applying modern wound care to diabetic ulcer patients, 62.4% of diabetic ulcer patients underwent treatment regularly and 35.8% were uncooperative in undergoing treatment.(Yunus, 2015),(Pujiati & Suherni, 2019). Then the results of the study conducted by Triyanisa (2013) stated that almost 70% of visits

by diabetic ulcer patients intensively and regularly undergo wound care at the Surgery Polyclinic of Pamenangan Hospital, Central Java. Diabetic ulcer patients who are regular in their wound care have great potential in wound healing, both seen from the stage of the wound that is gradually reduced and the wound that has healed from treatment. This is in line with research conducted by Ninda (2010) that the stage of wounds in diabetic ulcer sufferers can decrease in patients who undergo routine treatment.

Wound care is very important because it encourages the progress of wound healing. The wound care schedule is determined based on the severity of the wound, for example we can lift it from the dressing side, for example when the wound contains a lot of exudate, the dressing change is every 2 days, while wounds that contain little exudate are changed every 3-4 days. Compliance with the wound care schedule that has been determined by the therapist is one step to maintain the condition of the wound environment so that it remains moist (Suwondo, 2013).

In addition, wounds that are bandaged for too long without changing the dressing can cause maceration of the wound and the skin, while in wounds where the dressing change interval is very close, it can cause the effectiveness of topical therapy on the wound to be less than optimal. The treatment schedule can also improve control of diabetic ulcers suffered and education for patients and their families (Suwondo, 2013). According to researchers, what influences the length of diabetic ulcer treatment to the wound care schedule is the level of compliance of diabetic ulcer sufferers to their wound care schedule, for example from changing wound dressings. Regular wound care can support the acceleration of wound healing because it is expected that the dressing can provide a moist environment for the wound.

The Effect of Wound Care on Wound Healing in Diabetic Patients

The results of the p-Value statistical test based on table 5.16 are $p = 0.026 > \alpha = 0.05$, it can be concluded that there is a significant influence between wound care and wound healing in diabetic patients, that there are 40 people who recovered consisting of 27 people (67.5%) with modern traditional wound care and 13 people (32.5%) with modern care only. And there are 25 people who did not recover consisting of 8 people (32.0%) with modern traditional care and 17 people (68.0%) with modern care only. From these results, if modern traditional care is carried out, it will increase 4.969 times the healing of diabetic patient wounds.

As the results of the study by Colin Vellyza and Listiana Devi (2022), wound healing using modern and conventional methods has the same effect, but with modern wound care, healing results are shown faster. In accordance with the results of the study by Muhamad Irwan et al. (2022) that modern wound care has a better effectiveness in the development of wound repair compared to the conventional wound care group. Modern dressings are very effective in accelerating the wound healing phase. In modern traditional wound care here, it provides an understanding to patients when they cannot visit a health center that provides modern care, then patients still use traditional methods too, so that they can still carry out wound care according to the predetermined schedule.

CONCLUSION

Based on the results of the study and discussion on the determinants of wound healing in diabetic patients at the Cipadu Health Center, the following conclusions were obtained: (a) More than half of the respondents were in late adulthood (35-44 years), more than half of the respondents were male, half of the respondents had early wound stages, more than half of the respondents had wound care for 25-48 weeks, half of the respondents had regular wound care schedules, more than half of the respondents had modern and traditional wound care, and more than half of the respondents had recovered from diabetic wounds. (b) The recovery of respondents in late adulthood was greater than that of the elderly, but there was no significant relationship between age and wound healing in diabetic patients at the Cipadu Health Center. (c) The recovery of male

respondents was greater than that of female respondents, but there was no significant relationship between gender and wound healing in diabetic patients at the Cipadu Health Center. (d) Respondents' healing at the early wound stage was greater than at the late wound stage, but the wound stage and wound healing of diabetic patients at the Cipadu Health Center did not have a significant relationship. Respondents' healing at the treatment period of 1-24 weeks was greater than at 25-48 weeks, but the length of wound care and wound healing of diabetic patients at the Cipadu Health Center did not have a significant relationship. Respondents' healing at the regular wound care schedule was greater than at the irregular one, but the wound care schedule and wound healing of diabetic patients at the Cipadu Health Center had a significant relationship. Respondents' healing at the modern traditional wound care was greater than at the modern one, but wound care and wound healing of diabetic patients at the Cipadu Health Center had a significant relationship.

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