MPPKI (November, 2024) Vol. 7 No. 11

ISSN 2597– 6052

DOI: https://doi.org/10.56338/mppki.v7i11.6188

MPPKI

Media Publikasi Promosi Kesehatan Indonesia

The Indonesian Journal of Health Promotion

Research Articles *Open Access*

Effectiveness of Foot Care in Preventing Skin Damage and Risk of Diabetic Foot Wounds in Diabetes Mellitus Patients

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ABSTRACT

Introduction: Diabetes mellitus (DM) type II is a disease characterized by increased blood sugar levels which can cause many complications. The complications of DM that often occur are skin damage and diabetic foot wounds, because in general patients are not aware of the presence of ulcers due to the neuropathy they are experiencing. The risk of foot injuries can increase the need for treatment and care in patients. However, the risk of foot injuries can be detected early by the patient independently by carrying out regular examinations of the patient's feet. Providing foot care can reduce the incidence of skin damage and the risk of diabetic foot wounds.

Objective: The aim of the research is to analyze the effectiveness of foot care in preventing skin damage and the risk of diabetic foot wounds in diabetes mellitus patients.

Method: This research method uses a quasi-experimental design with a pretest posttest one group design. This research was conducted at the Undata Hospital in the Bougenvile room with a population of 31 participants. The selection of respondents was based on inclusion criteria, namely: age ≥ 30 years and suffering from DM.

Result: The results of the analysis used the paired sample t-Test. The average skin damage prevention score for DM patients before giving foot care was 2.97 and the skin damage prevention score after being given foot care was 2.52, respectively, experiencing a decrease in skin improvement of 0.45. These results show that the average value of diabetic ulcer risk for DM patients before being given foot care was 2.81 and the average value after being given foot care was 2.16 with a difference in improvement in the risk of diabetic ulcers of 0.65 which shows that the p-value is $0.000 < \alpha$ (0.005) then H0 is rejected and H1 is accepted. This shows that there is an effect after being given effective foot care on preventing skin damage and the risk of diabetic ulcers in DM patients at Undata Regional Hospital.

Conclusion: This research proves the influence of the effectiveness of foot care on preventing skin damage and the risk of diabetic ulcers in DM patients at Undata Hospital.

Keywords: Effectiveness; Foot Care; Damage to Skin Integrity; Foot Wounds, Diabetes Mellitus

INTRODUCTION

Diabetes mellitus (DM) is one of the most common chronic diseases throughout the world. WHO estimates that 60% of the population of diabetes sufferers will come from developing countries in Asia by 2025. Currently, India is the country with the second largest number of people suffering from type 2 DM. Along with the increase in DM are the disease's associated complications. Some important complications include coronary artery disease, nephropathy, retinopathy, microalbuminuria, and neuropathy. Among these complications, diabetic neuropathy is one of the most common and serious complications(1).

There are approximately 422 million people worldwide with diabetes, the majority living in low- and middle-income countries, and 1.5 million deaths are directly attributed to diabetes each year. The number of cases and prevalence of diabetes has continued to increase over the last few decades, where in Indonesia in 2018 the prevalence of DM was 8.5 percent.(2).

Diabetes Mellitus can cause acute complications and chronic complications. Acute complications can include hypoglycemia, non-ketosic hyperosmolar hyperglycemia and diabetic ketoacidosis(3). Meanwhile, long-term complications can include macrovascular changes and microvascular changes. Macrovascular changes occur in large blood vessels caused by atherosclerosis (4).

Artherosclerosis, if it affects the arteries of the lower extremities, can cause disturbances in peripheral blood flow which can last a long time and will increase the incidence of gangrene and amputation in diabetic clients(5). Neuropathy and disorders of the wound healing process also play a role in the occurrence of diabetic foot disease (6). Approximately 15% of diabetes mellitus clients in the course of the disease experience complications from diabetic ulcers, especially ulcers on the feet..

A person who suffers from diabetes mellitus has a higher risk of experiencing foot problems due to reduced local pain sensation (neuropathy), which makes the client unaware and often ignores the injury that occurs(7). Decreased blood circulation in the legs and damage to the blood vessel endothelium contribute to the emergence of diabetic foot by decreasing the amount of oxygen and nutrients supplied to the skin and other tissues, causing wounds to not heal(8).

It is important for DM clients to know how to prevent ulcers from appearing on the feet so that ulcer amputation can be avoided(9). DM clients must be diligent in caring for and examining their feet to avoid the occurrence of diabetic feet and the defects that may arise. Increased knowledge of diabetes mellitus clients regarding how to prevent diabetic foot which can improve the quality of life of diabetes clients so that clients can enjoy normal life in general, such as not suffering from diabetes mellitus, and clients do not need to spend excessive money on treatment that should not be needed(10).

As the number of diabetes sufferers increases, the risk of complications experienced will increase. Neuropathy is a microvascular complication that results in loss of sensation in the feet, causing repeated small injuries that the sufferer is unaware of, which is often called diabetic foot (11). Diabetic foot begins with neurological disorders that can increase pressure on the feet, causing characteristic deformities to appear on the feet, dry skin, fissures and calluses(12). Research conducted by Isip et al. (2016) stated that of 170 diabetes sufferers, 62% were at risk of developing diabetic foot. Diabetic foot events can lead to amputation which increases treatment costs and reduces the quality of life of diabetes mellitus sufferers.

Several nursing interventions that nurses have carried out to prevent diabetic foot wounds. The nursing intervention that nurses often carry out is education or teaching about self-monitoring of diabetic feet(10). This teaching can be done individually or only on the client or it can involve people close to the client who can help the client implement the foot care teaching they receive from the nurse(13)

The increase in the incidence of diabetic foot ulcers and amputations can indirectly worsen the social, economic and psychological conditions of sufferers. This is related to the long treatment time required for the healing process of diabetic ulcers which ultimately has an impact on increasing the burden of treatment costs for sufferers and their families(14).

Educational efforts to increase clients' ability to prevent diabetic foot need to be carried out so that clients are able to control risk factors for diabetic foot (15). Through this education, it is hoped that diabetic foot complications will not occur. DM clients will be free from the risk of amputation due to gangrenous wounds in the lower limbs(15).

The prevalence of diabetic foot sufferers in Indonesia is estimated at 15% with a mortality rate of 32%. This is supported by data that diabetic foot is the most common cause of hospital admission at 80%. Factors that cause diabetic foot come from endogenous factors and exogenous factors. Endogenous factors include neuropathy and angiopathy, while exogenous factors include trauma and infection. Loss of sensation (decreased sensitivity) is one of the main factors in the occurrence of foot ulcers and slow wound healing. This infection can cause amputation wounds. Around 40-70% of all lower extremity amputations are caused by DM(16). Type 2 DM sufferers who experience complications from neuropathy have a low quality of life and incur expensive health costs. Diabetic

neuropathy in Indonesia is 60%. According to the Indonesian Hospital Association Data and Information Center (PERSI), the prevalence of neuropathy in 2011 in DM patients was more than 50%.

Based on initial data collection carried out at Undata Regional Hospital, Palu, this is because Undata Regional Hospital is the highest referral center in Central Sulawesi, where the number of cases of diabetes mellitus patients treated in 2021-2022 is 1867 people with an average of 7 days of treatment(17). There will be 166 cases of diabetic foot wounds in 2023 in the Bogenvile room and in 2024 from January to August there will be 126 patients experiencing diabetic ulcers. Diabetes mellitus has a very dangerous impact because it can cause complications. Diabetes complications occur in all organs of the body with the cause of death being 50% due to coronary heart disease and 30% due to heart failure. For this reason, research is needed to determine the effectiveness of foot care in preventing skin damage and diabetic ulcers in diabetes mellitus patients (18).

Apart from the things above, it turns out that diabetic foot care will greatly influence the prevention of chronic complications of diabetic feet such as ulcers or even gangrene. This will save patients from amputation which is still a scourge for DM sufferers at Undata Regional Hospital, Central Sulawesi province.

METHOD

This research uses a quantitative type of research with a one-group pre-test and post-test design and is quasi-experimental in nature. The population in this study were all DM patients in the Bougainvillea room at Undata Hospital, totaling 31 people. With the sampling method using total sampling. The research was carried out on 01 August - 30 September 2024 at Undata Hospital. The independent variable in this research is the effectiveness of foot care. The dependent variable is prevention of skin damage and risk of diabetic foot injuries.

This research instrument was in the form of a questionnaire and checklist sheet given to respondents to determine the prevention of damage to skin integrity and the risk of diabetic foot wounds in diabetes mellitus patients before being given foot care intervention. And do the same thing after being given foot care intervention.

Foot hygiene care using Instruments and Foot Care Guide for Diabetes Mellitus Patients. Includes knowledge of foot care, nail cutting, foot hygiene and foot care. This foot care is summarized into 4 important points from the results of clinical discussions from representatives of academic staff and professional health workers across professions: Caring for your feet by diligently cleaning your feet with warm water, Caring for your feet by regularly applying foot moisturizer such as olive oil, Caring for your feet professionally. health for calluses and other foot problems and routine at least monthly foot examinations. How to measure skin integrity using the Wagner Scale by assessing the depth of the ulcer and the presence of osteomyelitis or gangrene using grades, consisting of grades 0 to 5 and the risk of ulcers using the Inlow's 60 second diabetic foot screening tool which consists of 12 indicators.

The data were analyzed using the SPSS 26 statistical method with paired sample t-test analysis, to determine significant differences between before and after the intervention. Paired t-tests are used to compare a single population before and after an experimental intervention or at two different points in time and to test for a “change” or “difference” in the means between two related groups, but not both at the same time

RESULTS

Based on the results of research conducted with the aim of analyzing the effectiveness of foot care in preventing skin damage and the risk of diabetic foot injuries in diabetes mellitus patients, at Undata Hospital, Prov. Central Sulawesi. So the following results are obtained;

Univariate Analisys

In this section, general data is presented in the form of characteristics of diabetes mellitus patients, namely regarding age, gender, education and occupation, duration of DM and history of injuries which can be seen in table 1 and table 2.

Table 1. Table of frequency of diabetes mellitus patients according to age, gender, education, occupation, duration of DM and history of wounds

Characteristics	Component	n (31)	%
Age	Usia Pertengahan (45-54 tahun)	28	90.3
	Lansia (55-65 tahun)	3	91.7
Gender	Woman	27	87.1
	Man	4	12.9
Education	SD	1	3.2
	SMP	9	29.0
	SMA	20	64.5
	Perguruan Tinggi	1	3.2
Work	IRT	25	80.6

	Wiraswasta	5	16.1
	PNS	1	3.2
Long time DM	New < 5 years	3	9.7
	Duration ≥ 5 years	28	90.3
Wound History	There is	26	83.9
	There isn't any	5	16.1

Based on table 1. DM patients are more middle aged (45-54 years) by (90.3%), gender is more female (87.1%), more high school education (64.5%) followed by junior high school education (29.0%), more work many housewives amounted to (80.6%). Patients aged ≥ 5 years were as large (90.3%) and for wound history of DM patients the average was (83.9%).

Bivariate Analisys

Table 2. Data on Prevention of Damage to Skin Integrity and Risk of Diabetic Ulcers in DM Patients before and after

Subject characteristics	***Pre-Test*** **n=31**		***Post-Test*** **n=31**	
	f	**%**	**f**	**%**
Prevention of Skin Damage				
Grade 2	6	19.4	15	48.4
Grade 3	20	64.5	16	51.6
Grade 4	5	16.1		
Mean	2.97		2.52	
Median	3.00		3.00	
Std Deviasi	0.605		0.08	
Risk of Diabetic Ulcers				
Low risk if < 8			2	6.5
Medium Risk If 8 - 16	6	19.4	22	71.0
High risk if > 16	25	80.6	7	22.6
Mean	2.81		2.16	
Median	3.00		2.00	
Std Deviasi	0.402		0.532	

Based on table 2. above, the results showed that before being given foot care, around (64.5%) of skin damage prevention had grade 3, some (16.1%) of patients had grade 4, and there were (19.4%) grade 2 in carry out prevention of skin damage. After being given the effectiveness of foot care in improving skin tissue, half of the respondents experienced a decrease in grade 2 (48.4%) and grade 3 (51.6%). The difference between the mean score for preventing skin damage in DM patients before giving foot care was 2.97 and the score for preventing skin damage after being given foot care was 2.52, each of which experienced a decrease in skin improvement of 0.45. The table above shows the results that before foot care, more than half (80.6%) had a high risk of diabetic ulcers, there were (19.4%) a moderate risk. After being given the effectiveness of foot care, the majority (71.0%) had moderate risk, high risk (22.6%) and low risk (6.5%).

Table 3. Distribution before and after foot care intervention among respondents

	Mean *Pre-test*	Mean *Post-test*	Selisih	*P Value*
Prevention of Skin Damage	2,97	2,52	0,45	0.002
Risk of Diabetic Ulcers	2,81	2,16	0,65	0.000

Table 3. Shows the results of analysis with. The average skin damage prevention score for DM patients before giving foot care was 2.97 and the skin damage prevention score after being given foot care was 2.52, respectively, experiencing a decrease in skin improvement of 0.45. The table above also shows the average value of diabetic ulcer risk for DM patients before being given foot care was 2.81 and the average value after being given foot care was 2.16 with a difference in improvement in the risk of diabetic ulcers of 0.65 which shows that the p-value equal to 0.000 < α (0.005), then H0 is rejected and H1 is accepted. accepted. This shows that there is an effect after being given effective foot care on preventing skin damage and the risk of diabetic ulcers in DM patients at Undata Hospital, Central Sulawesi Province.

DISCUSSION

This research was conducted at Undata Regional Hospital which is a local primary health facility. The results of the study showed that the majority of diabetes (DM) patients were aged <60 years and were female, and there was a significant difference in the rate of repair of leg wounds in DM patients before and after. foot care intervention. This is in accordance with the article which states primary health care should be the first line for detecting, evaluating and treating patients at risk of diabetic foot (19). These results are in line with previous research which stated that women have better abilities in carrying out foot care (19). Another study states that age is a predictor of foot care behavior (19). Most younger people have not experienced a decline in function either physically or cognitively.

The results of the study stated that some respondents had a duration of suffering from DM > 5 years. Longer duration of DM is associated with glycemic control. Poor glycemic control can increase oxidative stress and tissue damage through molecular pathways. The next impact is a decrease in sensorimotor function with a longer duration of DM, thereby increasing the risk of developing diabetic foot. The next demographic characteristic is the degree of neuropathy, which shows that the majority of respondents have a mild degree of neuropathy. These results are in line with previous studies through the same physical examination stages showing that the majority of respondents had mild degrees of neuropathy (20). Mild neuropathy can develop into moderate to severe neuropathy if proper treatment is not carried out.

Foot care performed in diabetes includes: (1) general foot care, such as foot hygiene, self-assessment of the feet, regular use of moisturizer on dry areas and proper toenail trimming; (2) choosing footwear, avoid walking barefoot. According to the International World Group Diabetic Foot (IWGDF) foot care protocol is as follows: (1) examine the feet annually for signs or symptoms of peripheral neuropathy and peripheral arterial disease; (2) screening for a history of foot ulceration or lower extremity amputation, peripheral arterial disease, foot deformity, pre-ulcerative signs on the feet, poor foot hygiene, and ill-fitting or inadequate footwear; (3) encourage people with diabetes to check the feet and inside of shoes every day, wash the feet every day (with careful drying, especially between the toes), avoid using chemical agents or plasters to remove calluses or corns, use emollients to lubricate dry skin, and cut toenails straight across.

The results of the study show that there are differences in foot care behavior for people with diabetes before and after being given foot care, most of the foot care can be done by the patient independently (21). Foot care is an effective management of DM in preventing diabetic foot disease. Foot care is an effective intervention and does not require a lot of money. This is in line with the tools and materials used during 3F foot care that are easy to use and accessible to people with diabetes.

Foot ulcers in diabetes can widen and tend to take a long time to heal due to infection. High blood sugar levels are food for germs to reproduce and cause infections to get worse. Infections that get worse and are not treated immediately can cause gangrene. Amputation is necessary to prevent gangrene from spreading (22). This must be done immediately to prevent complications from occurring. The results of research conducted by Mariam et al. (2017) that the incidence of diabetic ulcers at Gonhar Hospital in Ethiopia is high, namely 13.6%, due to one of the factors being poor foot care.

One of the efforts to treat or prevent diabetic feet is to carry out foot care. Preventive foot care includes washing your feet properly, drying them and brushing them. Be careful not to let the gaps between your toes get wet. Inspection of the feet should be done daily to check for redness, blisters, fissures, callus or ulceration(23).

The significant increase in the average score between post test 1 and post test 2 in diabetes foot care practices indicates that health education will have a more significant effect if carried out in more than one meeting. One of the obstacles in diabetes health education is the assumption that diabetes education is a one-time activity. To be more effective, education for diabetes patients must be provided on an ongoing basis and play an important role throughout the lives of people with diabetes. Health education carried out more than once is expected to provide a deeper understanding regarding the foot care material provided to people with diabetes mellitus to prevent complications of diabetic foot ulcers.

The effectiveness of foot care aims to improve foot care knowledge and behavior, as well as encourage patience to adhere to this foot care advice. 3F foot care is expected to become a diabetic foot health program, where similar research states that a diabetic foot health program is able to prevent diabetic foot complications in Type 2 DM. Another study states that health education programs are needed to improve patients' ability to carry out foot care independently(24).

The results of this research showed that foot care behavior had a positive value. Where the majority of respondents had performed foot care in the last month. This includes checking feet, cleaning feet, keeping feet moist, clipping toenails, using footwear, checking footwear and regular check-ups with a doctor. These foot care behaviors are one of the non-pharmacological therapies that are useful in preventing chronic complications in the form of foot nerve death in sufferers of diabetes mellitus or diabetic neuropathy(25).

Everyone should take care of their feet, especially DM sufferers. This is because diabetes sufferers are very susceptible to wounds on their feet, where the healing process of these wounds also takes a long time. So if everyone is willing to take good foot care, it will reduce the risk of complications in the feet. Therefore, good foot care can prevent diabetic feet, because foot care is one of the quick prevention factors to prevent foot problems that can cause foot ulcers. Better practices in foot care will reduce the risk of developing diabetic foot. Because preventing the occurrence of diabetic foot is better than the healing process. Because the healing process for diabetic feet takes a long time.

This shows that education has a big influence on diabetic foot prevention practices. Through education, DM clients will achieve a full and complete understanding of themselves, and clients will behave in new, healthier ways for themselves who suffer from DM, one of the problems they will face is the risk of diabetic feet. Education for DM clients who have risk factors for diabetic foot wounds needs to be carried out by family or community nurses as an effort to prevent chronic complications from DM and also reduce the number of amputations in DM clients. Socialization and education need to be carried out among nurses and health cadres in community settings to detect diabetic foot wounds early as an effort to prevent amputation(26).

The limitations of this research can be seen from the sample, the absence of a control group and time constraints in the research process. Family involvement in DM management is very necessary because the family is the main caregiver while the patient is at home. The family environment can have a positive influence in educational efforts on foot care behavior for diabetes patients.

CONCLUSION

Based on the results of the analysis and discussion of research on the effectiveness of foot care in preventing skin damage and the risk of diabetic foot wounds in DM patients at Undata Hospital, it can be concluded that the effectiveness of foot care can effectively reduce skin damage and the risk of diabetic foot wounds in diabetes mellitus patients, so that can be recommended to be carried out routinely for DM patients in general.

SUGESTION

This research can provide great benefits for health workers, patients and families of DM patients at Undata Hospital because it can provide valuable insight in increasing knowledge and skills related to the importance of the effectiveness of foot care in preventing skin damage and the risk of diabetic foot wounds in diabetes mellitus patients. Furthermore, other researchers can use the results of this research as a reference for further research which aims to increase knowledge and skills in preventing skin damage and the risk of diabetic foot wounds. By leveraging these findings, future research can explore additional methods and tools to further improve health education. Therefore, this study serves as basic research that can inform and inspire ongoing efforts to reduce the incidence of amputations in diabetes mellitus patients through education and awareness, ultimately contributing to improving the overall health of diabetes mellitus patients in daily life. Recommend further research to explore long-term effects of foot care practices on diabetic foot outcomes. Suggest expanding the intervention to a control group for comparative analysis.

REFERENCES

1. Singh S, Jajoo S, Shukla S, Acharya S. Educating Patients Of Diabetes Mellitus For Diabetic Foot Care. J Family Med Prim Care. 2020;9(1):367.
2. Kemenkes RI. Laporan Riset Kesehatan Dasar (Pertama). Jakarta; 2018.
3. Nicolucci A, Romeo L, Bernardini M, Vespasiani M, Rossi MC, Petrelli M, Et Al. Prediction Of Complications Of Type 2 Diabetes: A Machine Learning Approach. Diabetes Res Clin Pract. 2022 Aug 1;190.
4. Xu L, Yan X, Tang Z, Feng B. Association Between Circulating Oxidized Oxldl/LDL-C Ratio And The Severity Of Coronary Atherosclerosis, Along With Other Emerging Biomarkers Of Cardiovascular Disease In Patients With Type 2 Diabetes. Diabetes Res Clin Pract. 2022 Sep 1;191.
5. Rusli AA, Soelistijo SA. Extensive Thrombosis With Amputation Of Digit I Pedis Dextra: A Case Report In Indonesian Adult With Type 2 Diabetes Mellitus. Int J Surg Case Rep. 2022 Mar 1;92.
6. Chapman S. Foot Care For People With Diabetes: Prevention Of Complications And Treatment [Internet]. Vol. 22, 226 British Journal Of Community Nursing. 2017. Available From: Http://Www.
7. Palomo AT, Pires APM, Matielo MF, De Athayde Soares R, Pecego C, Sacilotto R, Et Al. Microbiology Of Diabetic Foot Infections In A Tertiary Care Hospital In São Paulo, Brazil. Antibiotics. 2022 Aug 1;11(8).
8. Hatem MA, Kamal DM, Yusuf KA. Diabetic Foot Limb Threatening Infections: Case Series And Management Review. Vol. 48, International Journal Of Surgery Open. Elsevier Ltd; 2022.
9. Nguyen TPL, Edwards H, Do TND, Finlayson K. Effectiveness Of A Theory-Based Foot Care Education Program (3STEPFUN) In Improving Foot Self-Care Behaviours And Foot Risk Factors For Ulceration In People With Type 2 Diabetes. Diabetes Res Clin Pract. 2019 Jun 1;152:29–38.

10. Ju HH, Ottosen M, Alford J, Jularbal J, Johnson C. Enhancing Foot Care Education And Support Strategies In Adults With Type 2 Diabetes. J Am Assoc Nurse Pract. 2024 Jun 1;36(6):334–41.
11. Anatasia Nazier S, Karma A, Anatasia Nazier Jurusan Ortotik Prostetik S, Kesehatan Kemenkes Jakarta P. Foot Screening Dan Pengaruh Edukasi Terhadap Pengetahuan Dan Perilaku Pencegahan Diabetic Foot Ulcer Pada Individu Dengan Diabetes Mellitus Foot Screening And The Effect Of Education To Knowledge And Behavior Of Diabetic Foot Ulcer Prevention In People With Diabetic Mellitus [Internet]. Vol. 12, Jurnal Kesehatan. Online; 2021. Available From: Http://Ejurnal.Poltekkes-Tjk.Ac.Id/Index.Php/JK
12. Natalia Nadia Azalia Dyah Wibowo, Muhammad Anis Taslim, Felicia Risca Ryandini. Pengaruh Foot Care Education Melalui Media Audiovisual Terhadap Tingkat Pengetahuan Pasien Diabetes Mellitus. DIAGNOSA: Jurnal Ilmu Kesehatan Dan Keperawatan [Internet]. 2023 Sep 16;1(4):69–82. Available From: Https://Journal.Widyakarya.Ac.Id/Index.Php/Diagnosa-Widyakarya/Article/View/1296
13. Parliani P, Rungreangkulkij S, Nuntaboot K. Foot Care Among Diabetes Patients: A Concept Analysis. Vol. 13, Nurse Media Journal Of Nursing. Diponegoro University- Department Of Nursing, Faculty Of Medicine; 2023. P. 246–62.
14. Hermansyah H, Setiawan A, Hendriana Y. Efektifitas Foot Care Education Terhadap Praktik Perawatan Kaki Dalam Upaya Pencegahan Risiko Ulkus Kaki Diabetik Pada Penderita Diabetes Di Wilayah Kabupaten Kuningan. Jurnal Ilmu Kesehatan Bhakti Husada: Health Sciences Journal. 2018 Dec 3;9(2):1–7.
15. Nies MA, Mcewen M. Community/Public Health Nursing Promoting The Health Of Populations SIXTH EDITION. Texas; 2019.
16. Safruddin S, & HR. Analisis Faktor Yang Mempengaruhi Kejadian Ulkus Kaki Pada Pasien Diabetes Melitus. Jurnal Ilmiah Kesehatan Diagnosis,. 2018;12(3):277–84.
17. Made Fira Hartini N, Adyanti, Ansar, Chandriasih P, Hafid F, Faisal E, Et Al. Kepatuhan Diet Pada Pasien Rawat Inap Penyandang Diabetes Melitus Tipe 2 Description Of Diet Compliance In Inpatients With Type 2 Diabetes Mellitus. Jurnal Ilmiah Kesmas. 2024;4(2):59–65.
18. RSUD Undata. Data Rekam Medik. Palu.Provinsi Sulawesitengah; 2024.
19. Sari Y, Upoyo AS, Isworo A, Taufik A, Sumeru A, Anandari D, Et Al. Foot Self-Care Behavior And Its Predictors In Diabetic Patients In Indonesia. BMC Res Notes. 2020 Feb 1;13(1).
20. Ruiz-Toledo J, Zalacain-Vicuña AJ, De Planell-Mas E. Evaluation Of The Complementary Health Provision Of The Podiatric Foot Care Program For Diabetic Patients In Catalonia (Spain). Int J Environ Res Public Health. 2021 May 2;18(10).
21. Windani CM, Haroen H, Nursiswati. Pengaruh Program Edukasi Perawatan Kaki Berbasis Keluarga Terhadap Perilaku Perawatan Kaki Pada Pasien Diabetes Melitus Tipe 2. Jurnal Keperawatan Padjadjaran. 2016;4.
22. Nikitara M, Constantinou CS, Andreou E, Diomidous M. The Role Of Nurses And The Facilitators And Barriers In Diabetes Care: A Mixed Methods Systematic Literature Review. Vol. 9, Behavioral Sciences. MDPI Multidisciplinary Digital Publishing Institute; 2019.
23. American Diabetes Association. Microvascular Complications And Foot Care: Standards Of Medical Care In Diabetes—2021. Diabetes Care. 2021 Jan 1;44:S151–67.
24. Adatia A, Wahab M, Shahid I, Moinuddin A, Killian KJ, Satia I. Effects Of Cigarette Smoke Exposure On Pulmonary Physiology, Muscle Strength And Exercise Capacity In A Retrospective Cohort With 30,000 Subjects. Plos One. 2021 Jun 1;16(6 June).
25. Adelian N, Safitri N, Purwanti LE, Andayani S, Artikel S. Hubungan Perilaku Perawatan Kaki Dengan Kualitas Hidup Pasien Diabetes Melitus Di Rsu Muhammadiyah Dan Klinik Rulia Medika Ponorogo. Health Sciences Journal [Internet]. 2022; Available From: Http://Studentjournal.Umpo.Ac.Id/Index.Php/HSJ
26. Widagdo W. Efektivitas Edukasi Faktor Risiko Kaki Diabetik Terhadap Praktik Pencegahan Luka Kaki Diabetik Pada Klien DM Tipe 2. JHCN Journal Of Health And Cardiovascular Nursing. 2022;2.