The Role of Health Education in Preventing Incidents of Diabetic Ulcers in Type 2 Diabetes Mellitus

Janu Purwono[1*], Irwan Budiono[1], Oktia Woro Kasmini H[1], Feddy Setio Pribadi[1],

Rita Sari[2]

[1]Universitas Negeri Semarang, Central Java, Indonesia

[2]University of Muhammadiyah Pringsewu

Corresponding author: janupurwono@students.unnes.ac.id

Abstract: Type 2 Diabetes Mellitus (T2DM) increases globally every year, along with the increase in DM, the incidence of diabetic ulcers also increases. Education is an important pillar because it can increase health literacy, namely increasing knowledge and ability to manage self-care for DM sufferers. This study aims to determine the impact of health education on preventing diabetic ulcers in diabetes mellitus patients. This type of research is quasi-experimental and was designed using a pre and post test group design with an intervention group. The research was conducted for 9 months, the study population was 325 T2DM people in Pringsewu Regency. The total sample was 107 T2DM people and the sample was determined using a purposive sampling technique. The research results show that the determining factor for the occurrence of diabetic foot ulcers is foot care activities, p-value = 0.000 with OR: 42.778. Evaluation at 36 weeks after intervention showed a decrease in signs of diabetic foot ulcers (86.0%). Conclusion; Health education can prevent the occurrence of diabetic ulcers in Diabetes mellitus. Suggestion: T2DM sufferers are advised to take proper foot care so that diabetic foot ulcers can be prevented.

Keywords: Health Education, type 2 diabetes mellitus, diabetic ulcers

INTRODUCTION

The IDF Diabetes Atlas (2021) reports that 10.5% of the adult population (20-79 years) suffers from diabetes, with almost half unaware that they live with the condition. By 2045, IDF projections show that 1 in 8 adults, approximately 783 million, will be living with diabetes, an increase of 46%. More than 90% of people with diabetes have type 2 diabetes, which is driven by socio-economic, demographic, environmental and genetic factors. (IDF, 2024).

The results of the RISKESDAS report found that Lampung Province was ranked 25th out of 33 provinces in Indonesia with the prevalence of DM in general, experiencing a drastic increase over the last 5 years. In 2013 the prevalence rate of DM in adults reached 6.9 and continued to

increase to 8.5% in 2018 (Depkes Ri, 2018). Diabetes mellitus in 2021 in Pringsewu district will number 3,868 patients / 78.6% and in 2022 the estimate will be DM sufferers. 3,882 patients / 78% of estimated DM sufferers (Pemda & Pringsewu, 2022). Based on data obtained at Pringsewu Hospital, Lampung in 2023, 138 patients with diabetic foot ulcers, and 36 patients had to be amputated due to diabetic foot ulcers (Medical record Pringsewu Hospital, 2023).

Diabetes mellitus (DM) is a metabolic disorder characterized by hyperglycemia caused by disruption of the islets of Langerhan in the pancreas and insulin resistance (Diabetes, 2013). This condition can cause many noticeable symptoms, such as polyuria, polydipsia, hyperphagia, weight loss, diabetic ketoacidosis, and hyperosmolar coma; and various long-term complications, including diabetic retinopathy, nephropathy, and diabetic neuropathy, diabetic foot, and recurrent infections (Z. Tao, A. Shi, 2015). DM, one of the most common metabolic disorders, affected more than 463 million people globally in 2019, and its prevalence is expected to reach 700 million by 2045 (Jin and Ma 2021(Jin & Ma, 2021). Effective diabetes management is essential to prevent complications and reduce clinical and financial burden (Evans et al., 2021).

Diabetes and its complications are a major public health problem resulting in long-term hospitalizations, amputations, and poor quality of life for patients(Cho et al., 2018). According to International Diabetes Federation (IDF) estimates, the prevalence of diabetes will increase by 156% in Africa, 16% in Europe, 35% in North America and the Caribbean and 84% in North America and the Caribbean in Southeast Asia by 2045 (Cho et al., 2018). In 2017, the International Diabetes Federation estimated that 451 million adults were living with diabetes worldwide. The projected increase in 2045 is estimated from 451 to 693 million if no effective prevention methods are implemented (Cho et al., 2018). The global prevalence of diabetes among those aged 20–79 years in 2021 is estimated to be 10.5% (536.6 million people), increasing to 12.2% (783.2 million) in 204 (Sun, H., 2021)..

The increasing prevalence of this disease is accompanied by an increase in its complications, affecting almost every system in the body. Due to the overall complications of diabetes, diabetic foot ulcers (DFU) are the main cause of morbidity and mortality as well as other adverse complications (Aboobakar & Allingham, 2014). Death after diabetic foot ulcers and amputation, the rates are high: up to 70% of people die within 5 years after amputation and about 50% within 5 years after amputation develop diabetic foot ulcers (Graves, 2021).This is also a one of the complications of diabetes that can cause economic, social and public health burdens, especially in low-income communities (Al-rubeaan et al., 2017).

It was revealed that the prevalence of diabetic foot ulcers (DFU) globally is 6.3%, while the prevalence of DFU in Asia is 5.5% (Zhang et al., 2017). A common complication of DM is problems with the lower appendages. Diabetic ulcers (15%-85 %) is the cause of death in people with type 2 diabetes mellitus. In addition, every year more than 1 million diabetes sufferers have to have one of their lower body parts removed due to diabetes complications (Primanda et al., 2017).

Educating patients about the complications of foot ulcers and the need for appropriate medical care will help reduce the risk of complications and improve patient compliance (Tony I. Oliver, 2022). the management of foot diabetics is focused on preventing and overcoming the occurrence of amputations in the legs. 90% Ulcers on the feet will heal if a comprehensive therapeutic management is carried out multidisciplinary by reducing the burden on the feet, paying attention to the wound so that it is always moist (moist), infection management, debridement, revascularization as indicated (Siagan, 2019).

Health education of diabetic patients is crucial for control of diabetes (Makkiawouda et al., 2014).Lack of knowledge of diabetics can result in a lack of skills to care for themselves and can increase the morbidity and mortality of DM and the low quality of life of people with DM. To reduce the negative impact, patients must have preventive behavior towards their lifestyle so as not to cause long-term diabetic complications (N et al., 2022). Health education methods provide additional information so that patients who previously wondered about their disease can directly ask health workers (Amir & Munir, 2021).

Health education has an effect on diabetic foot care by demonstrating the ability to care for the feet of DM patients (Setianingsih, 2017), There is an effect of health education on diabetic foot care on knowledge of foot care in people with DM (Andriyanto, 2017). Health education of diabetic patients is a very important activity for diabetes control. Increasing the capacity of puskesmas, strengthening diabetic patient associations, and further research to study the effect of health education on diabetic patients (Makki Awouda1, 2014), The application of wellbeing instruction strategies can give extra data so that patients who already did not get it their ailment can straightforwardly inquire wellbeing specialists. Wellbeing instruction is exceptionally compelling on expanding the information of DM patients at the Tidore Islands Clinic (Amir & Munir, 2021).

Foot care education is education about procedures and the importance of foot care aimed at people with type II diabetes mellitus (McKenzie et al., 2017). There is a significant difference between scores of knowledge, self-efficacy and diabetes mellitus patients'behavior before and after

following foot care education program (Mahdalena & Purwanti Ningsih, 2016). This study aims to determine the impact of health education on preventing diabetic ulcers in people with type 2 diabetes mellitus.

Method

This type of research is quantitative with a quasi-experimental method and was designed using a pre and post test group design with an intervention group. The research was conducted in 2021 for 9 months starting in February-October 2021 at community health centers throughout Pringsewu Lampung district. The population in this study was 325 T2DM throughout Pringsewu Regency with the inclusion criteria in this study being: willing to be a respondent, the respondent had been diagnosed with type 2 DM for at least 1 year, lived in the Pringsewu Regency Health Center, was able to communicate well, had no speech/hearing problems , able to read and write.

The procedure in this study consisted of several stages: Stage I (pre-intervention): in the first week the researcher distributed questionnaires to respondents which contained information about; knowledge, self-efficacy, foot care activities and social support in T2DM respondents. Phase II (intervention): in the 2nd week the researchers conducted health education about foot care for T2DM sufferers. Phase III (post intervention): in the 36th week the researchers evaluated the implementation of health education and monitored signs of ulcers on the T2DM feet. Data collection techniques in this research were observation and the use of questionnaires. The use of questionnaires was carried out at pre-intervention and post-intervention and observations were carried out at post-intervention at week 36.

The number of samples in the study was 107 T2DM people, the sample was determined using a purposive sampling technique. A sample of 107 respondents was obtained from 9 community health centers in Pringsewu district. The number of samples at each health center was 12 people at 8 health centers and 11 people at 1 health center.

The questionnaire used in this research is: the one questionnaire asked about knowledge of diabetes mellitus is 23 item DKQ-24 (Diabetes Knowledge Questionaire). The second questionnaire asked about the self-efficacy of people with diabetes mellitus is 8 item (Ha, M., et al, 2014).The third questionnaire asked about foot care activities for patients with diabetes mellitus is 12 item (PERKENI, 2015). The fourth questionnaire asked about social support for patients with diabetes mellitus is 11 item (Mitra J, et al, 2017). Data analysis uses logistic regression test.

RESULTS

Sosiodemografi Responden

The characteristics of the respondents in this study are as follows:

Table 1 Socio-demographic characteristics of respondents (n = 107)

Variable	Frequency	%
Age		
18 – 65 years	92	86.0
66 – 79 years	15	14.0
Gender		
Female	79	79.4
Male	28	20.6
Ethnic		
Javanese	95	87.9
Lampungnese and sundanese	12	12.1
Religion		
Muslim	96	96.3
Non Muslim	11	3.7
The duration of illness		
1-10 years	26	24.3
More 10 years	81	75.7
The Education		
primary school, Junior high school	41	38.3
Senior high school	66	61.7
The Occupation		
Farmer, Housewife	92	85.9
Civil Servant/Indonesian National Army/Police/Retired, the private company	15	14.1

Table 1 shows people with type II diabetes mellitus with an age range of 18 years to 79 years. Most were aged 18-65 years (86.0%) and only 14.0% were aged more than 66-79 years.

The majority of respondents were female (79.4%), male respondents (20.6%), Javanese respondents (87.9%), and Lampung and Sundanese ethnic respondents (12.1%). Muslim (96.3%) compared to non-Muslim respondents (3.7%). Respondents whose illness lasted 1-10 years were (24.3%), and whose illness lasted more than 10 years (75.7%). Most of the respondents had elementary, middle school (38.3%) and high school (61.7%) education. Most respondents work as farmers and housewives (85.9%), as TNI/Polri/Retired, and in the private sector (14.1%).

Bivariate Test

Health education has an impact on knowledge, self-efficacy, foot care activities and social support. The bivariate test results in this study are:

Table 2. Significance of knowledge, self-efficacy, foot care activities, social support

No.	Variabel	Significance
1.	Knowledge	**0,003**
2.	Self-efficacy	**0,000**
3.	Foot care activities	**0,000**
4.	Social support	**0,015**

From table 2, the results show that health education and knowledge are meaningful with a p-value level of 0.003. Health education with salf efficaci is significant with a p-value level of 0.000. Health education with foot care activities is significant with a p-value level of 0.000. Health education with social support is significant with a p-value level of 0.015.

Multivariate Test

Interaction tests are carried out between variables that are thought to interact or not interact. The results of data processing using logistic regression analysis are in table 3.

Table 3. Multivariate Test Results

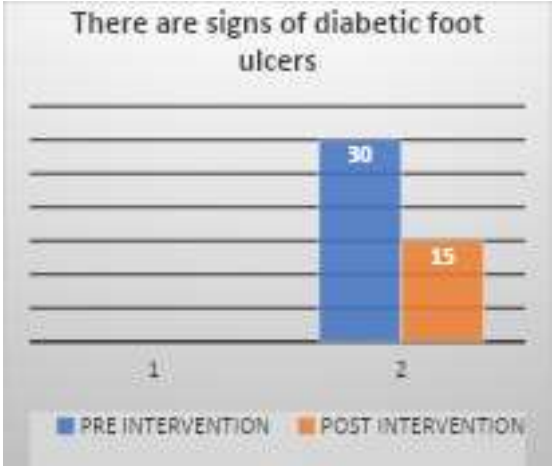
No.	Variabel	OR
1.	**Foot care activities**	**42.778**

Multivariate test results show that the most dominant variable in this study is foot care activities with a strength of OR 42,778.

Evaluation of Health Education in Type 2 Diabetes Mellitus

The health education that was carried out on T2DM respondents was evaluated at week 36 or at month 9. The monitoring results of the health education intervention had an impact on reducing signs of diabetic ulcers. The results of monitoring diabetic ulcer data are as follows:

Figure 1 Evaluation Diabetic foot Ulcers



Based on Figure 1, it can be seen that of the 107 respondents at pre-implementation: there were signs of diabetic foot ulcers in 30 people (28.0%) at week 36: after the health education was carried out there was a decrease in the number of respondents who had signs of diabetic foot ulcers to 15 people (14 .0%).

DISCUSSION

Demographic Characteristics

The results of this study are in accordance with IDF data in 2013 which shows that the majority of DM sufferers are in the age range 40-59 years, and 80% of DM sufferers in this group are in developing countries such as Indonesia (Farmasi, 2018). There is a significant relationship between age and type 2 DM. The age factor increases the incidence of type 2 DM in the working area of the Putri Ayu Community Health Center (Vadila et al., 2021).

There is a relationship between age and the incidence of diabetic ulcers. DM sufferers with diabetic ulcers at a young age will have a better quality of life than DM patients at an older age. This happens because usually their physical condition is better than their parents. Older patients are more at risk of developing diabetes and glucose intolerance due to degenerative factors, namely a decrease in the body's function to metabolize glucose (Fonna et al., 2023).

As we age, a person's body's physiological functions decrease, including decreased insulin secretion or resistance, so that the body's ability to control blood glucose becomes less than optimal. Ultimately, uncontrolled blood sugar levels will occur and cause long-term chronic complications, both macrovascular and microvascular, and one of these complications is diabetic foot ulcers (Ferawati, F., & Alfaqih, 2021).

The duration of illness in Diabetes Mellitus sufferers has the potential to cause wounds to appear. Research finds that complications appear after the disease lasts 10-15 years because long suffering from type 2 DM causes a continuous buildup of glucose in the blood, resulting in complications (Permana et al., 2017). This research is also in line with research conducted by Renny WA which stated that there was a relationship between the duration of suffering from DM and independent foot care behavior to prevent diabetic ulcers in DM patients at the internal medicine polyclinic at RAA Soewondo Pati Hospital (Aprilyasari, 2015). Suryati's research states that there is a relationship between the level of knowledge and the length of time suffering from diabetes and the incidence of diabetic ulcers (Suryati et al., 2019). Suryati's research is supported by Mahfud's research which states that there is a relationship between the duration of suffering from diabetes mellitus and knowledge of foot care in non-ulcer diabetes mellitus patients. People who suffer from diabetes for more than 5 years have twice the risk of developing ulcers than people who suffer from diabetes less than 5 years.(Fitria, N., et al, 2019).

The majority of respondents in the study were Muslim. Indonesia is a Muslim country/largest Muslim population, where an estimated 229 million Muslims live there. This number represents 87.2% of Indonesia's 263 million population. Or around 13% of the world's Muslim population (FR, 2020). The research results show that the majority of respondents who suffer from diabetes are Muslims. This is because most of the people around the research area are Muslim, so the majority of respondents are Muslim. The research conducted was in line with the results of research conducted by Pratama DA which showed that respondents were Muslim (75.2%), Christian (5.2%), Buddhist (15.5%), and Confucian (3.4%) (Pratama, D. A., et al, 2019).

The gender in this study was mostly female. The results of this study are in line with previous research which stated that the highest gender frequency was female respondents, namely 56 respondents (62.9%) out of 89 respondents (Firmansyah, 2019). Other research also states that the majority of respondents were women (58.3%) and men (41.4%) (Pratama, D. A., et al, 2019). This study shows that women experience more diabetic ulcers. Women are more capable and more patient in taking care of their feet, including checking shoes before and after wearing them, using moisturizer on their feet, and frequently checking the condition of their feet after washing (Hardianti, D et al, 2018)

The majority of ethnicities in this study are Javanese. The results of this research are in line with Arianti's research which states that the majority of respondents are Javanese (88.9%), compared to other ethnicities (11.1%) (Arianti, et al , 2015). Each ethnic group has certain views and values as well as ways of responding to changes in health status. This will of course influence individual choices and practices in treating the disease they suffer from (Astrada, 2014),

The majority of education in this study was high school. The results of this research are in line with previous research where the largest number of respondents with a high school education was 21 people (36.84%) (Ngurah, I. G. K. G. and Sukmayanti, 2014) A person's educational background influences a person's ability to understand objects and information. This refers to the concept (Notoatmodjo, 2012) that the higher a person's education, the easier it is to receive and process information.

Mustofa et al.'s research found that the majority of diabetes sufferers worked as housewives (41.4%) (Mustafa et al, 2016). The risk of developing diabetic ulcers in diabetic patients who do not work (housewives) can be caused by a lack of attention to diet and exercise, as well as a lack of exposure to information about diabetic foot ulcers and foot care (Kusumaningrum, N. S. D. and Asriningrat, 2016).

Most of the respondents were aged 40-59 years, female, Javanese. Muslim, works as a farmer and housewife, has been sick for more than 5 years. This is what causes the large number of diabetic ulcer sufferers in Pringsewu Regency.

Effect of Health Education on Foot Knowledge and Care

Based on the findings of this study, the majority of people have low knowledge regarding the prevention of diabetic foot after health education. Knowledge is one element that has an impact on behavior. Rias' research results support that 16 respondents (54%) had sufficient knowledge

about diabetic ulcers(Andy Rias, 2016). The knowledge factor has a 2.38 times chance of practicing foot care. Similar research was also conducted by Srimiyati which showed a significant relationship between knowledge and foot care in diabetes patients (Srimiyati, 2018).

Diabetes patients who have good foot care knowledge are 4.767 times more likely to carry out foot care compared to patients who have less knowledge. The level of knowledge of DM patients in preventing the occurrence of diabetic foot ulcers after receiving health education has largely increased so that there is an influence of providing health education on increasing the knowledge of DM patients in preventing the occurrence of diabetic foot ulcers (Chawla et al., 2019).

According to Chawla, diabetes sufferers who regularly carry out self-care (especially diet management) can achieve better glycemic control, so it was found that there was a significant difference between knowledge about self-care activities between glycemic control cases and uncontrolled cases (Chawla et al., 2019).Meanwhile, Arifin's research results show that there is a significant relationship between knowledge of type II diabetes mellitus patients and foot care practices in preventing injury (Windani Mambang Sari et al., 2016)

Most diabetes mellitus sufferers do not know about foot care and are at risk of developing foot ulcers, amputation, sepsis and death. Therefore, the importance of foot care must be communicated to patients as early as possible (Kishore et al., 2015) . To achieve good foot care requires good knowledge about DM foot care (Efriliana, 2018). Patient behavior in foot care is important in preventing diabetic foot ulcers(Windani M et al., 2016). Lack of information about diabetic foot ulcers causes low knowledge, attitudes and foot care actions in DM patients (Munali et al, 2019) . Adding information goes hand in hand with increasing knowledge so that patients have the ability to prevent both acute and chronic complications.Health education affects the knowledge improvement of Diabetes Mellitus patients in the Regional hospital of Tidore Islands (Amir & Munir, 2021). The educational intervention is an effective tool that implicated a significant change in patients' knowledge and attitude and effectively improved patient glycemic control (Zibaeenezhad et al., 2015).

Based on the description above, it can be concluded that education has a strong role in increasing a person's knowledge to do things that are important for their health, especially foot care for T2DM sufferers. And health workers, including nurses, are expected to play a role in providing health education to minimize complications. Nurses also act as educators who can help clients increase their level of health knowledge so that changes in client behavior occur after health education is carried out.

The Effect of Health Education on Self-Efficacy and Foot Care

There is an influence of health education on the 5 pillars of DM management on the self-efficacy of DM sufferers (Murdiyanti & Putri, 2019). Self-efficacy in self-management of DM patients needs to be carried out, considering that increasing self-efficacy is one of the independent nursing actions that can prevent diabetes complications (S. T. et Al, 2020). Increasing knowledge through education can increase self-efficacy and self-management behavior in type 2 DM patients. Knowledge and trust are the most important part of a person's success in carrying out self-management within their domain, namely in shaping behavior and patterns of client needs (Andy R, 2016).

Good self-efficacy can influence DM patients' actions in maintaining their health and the patient's mindset in self-care (Firmansyah, 2019). Patients who have good self-efficacy will always stick to their goals because they already understand what their hopes are. Likewise, vice versa, someone who has low self-efficacy will have an impact on low commitment to their goals because they do not or do not do these things, even understanding what their hopes are. (Rahman & Sukmarini, 2017). A person who suffers from DM and has a high self-efficacy score will have the potential to carry out the 4 pillars of DM which include diet, exercise, independent blood glucose control, taking medication and treating diabetic feet optimally so that their health is of high quality. Good. Life can be achieved (Frekuensi et al., 2015).

High self-efficacy encourages the formation of a person's mindset to achieve the expected results and thoughts to achieve the expected results throughout his life, but this must be supported by good goals (Andy Rias, 2016). Fitrika found in himself. research shows the effect of DSME on reducing the risk of diabetic ulcers in Type 2 DM outpatients (Fitrika et al., 2018). Foot care behavior itself is one part of self-care in DM patients, so someone who has good self-efficacy will motivated and have the enthusiasm to maintain their health by obediently carrying out DM foot care independently, this is more optimal when compared to DM foot care behavior. in DM patients who have less self-efficacy (Sa'adah, 2016).

Based on the explanation above, it can be concluded that the people of the Pringsewu District Health Center have high self-efficacy in carrying out diabetes mellitus foot care to prevent diabetic ulcers. According to researchers, this is because the community has obtained adequate knowledge and is willing and able to carry out a diabetes mellitus foot care program.

The influence of health education on foot activities and care

Foot care aims to prevent complications in the feet of diabetes mellitus sufferers. Foot care behaviors include checking your feet every day, keeping your feet clean every day, keeping your skin soft and smooth every day, cutting your nails properly, choosing and wearing the right footwear, and providing first aid if a foot injury occurs. (Sari, N. N., 2018),

Foot injuries are not only seen from DM patients' compliance with foot care but many other factors can cause foot injuries, such as poor control of blood sugar levels, irregular eating patterns, smoking history, and history of previous injuries (Ardi, 2015). Factors that influence foot care include internal factors, namely age, gender, income, knowledge, and duration of illness, as well as external factors, namely family and environmental support (Purwanti, 2017). Education is also a factor that can influence foot care behavior (Amelia, 2018), It was also stated that poor foot care behavior was influenced by low knowledge about foot care. The research above was followed by research from Chin et al., which showed a significant relationship between knowledge and foot care behavior (C. et Al, 2019).

Poor foot care behavior in a person can be at risk of developing foot ulcers (Ardi, 2014). Mufidhah's research regarding the description of foot care behavior in DM patients, namely: shows the results that foot care behavior is mostly poor, and respondents only carry out general foot care including washing feet and drying feet, apart from that there are still many respondents who carry out foot care on patients. DM. didn't check his feet. Many respondents do not carry out regular foot checks, this is due to a lack of information about the importance of checking their feet and nails every week (Mufidhah, 2019). Foot hygiene is important in foot care to prevent foot ulcers (Safruddin, & Hidayat2, 2018). Regarding the choice of footwear, most respondents rarely wear closed shoes. This research is in line with other research which states that the average number of respondents who use footwear is still not correct (Neli, 2015).There is a significant relationship between the use of footwear and diabetic foot injuries. The choice of footwear for DM sufferers needs to be considered. For example, not too small or inappropriate because it can cause friction and injury (Supardi, 2020).

Achieving good foot care in DM sufferers is influenced by a person's good knowledge regarding DM foot care (Efriliana, 2018). Good knowledge can be improved through educational programs about foot care for DM patients (Mahdalena, 2016). Education & foot care influences the prevention of diabetic foot ulcers. DM sufferers who are at risk of developing diabetic foot injuries experience complex problems that make it difficult to avoid injury. The foot education & treatment

model is very helpful in this condition, especially in preventing diabetic foot injuries. foot care can prevent diabetic foot ulcers (Hidayat et al., 2022).

Foot care is part of health management in reducing the incidence of diabetic foot ulcers. Improving the quality of life of diabetes sufferers can be done with good self-care, namely taking care of their feet independently to avoid complications that can worsen their condition. There is no best educational program without compliance, commitment and family support in carrying out treatment (Jannah et al., 2020). Foot care education for diabetics in a primary care setting improves their foot care practice and is likely to be effective in reducing the burden of diabetic foot ulcer (Saurabh et al., 2014)

. Regular and regular foot care can also be a good preventive measure to prevent further complications in diabetes mellitus sufferers. Therefore, the role of health workers, especially nurses, is very necessary in efforts to support the success of carrying out independent foot care for families and diabetes mellitus patients.

The Effect of Health Education on Social Support in foot care

Diabetes education has an impact on diabetes treatment. Benefits of diabetes education are mainly observed in terms of patient self-care and metabolic control of diabetes (Świątoniowska, N.,et al, 2019). There is a significant influence between knowledge and attitudes before and after being given health education to DM sufferers (Pratama, 2016).

Family support for diabetes mellitus patients is very necessary, especially in providing nursing care to individuals directly, physically and psychosocially. Based on the source of family support obtained, it can come from the individual's husband or wife and children (Al-Kahfi et al., 2016). Family support can be provided to all family members, healthy and sick, especially to people with diabetes mellitus. Family support is very necessary because it can have a positive impact on the psychological health, physical well-being and quality of life of Diabetes Mellitus sufferers

(rahmandhani, et al, 2016).

Research conducted by Jamaludin found a relationship between family support and dietary compliance in diabetes mellitus sufferers, where diet is one of the management of diabetes mellitus. (Choirunisa, 2019). Social support is very beneficial for the health and well-being of family members who suffer from Diabetes Mellitus, whatever the stress they experience (Setiawan, 2020). Rembang in his research found a significant relationship between family social support and self-care in type 2 diabetes mellitus patients at the Internal Medicine Polyclinic at Mokopido Toli-Toli

Hospital (Rembang, V., P., et al, 2017). while Ismonah found a relationship between family support and foot prevention efforts. diabetes in type 2 DM patients at Ungaran Hospital (Ismonah, I. and Octaviani, 2019). Similar research conducted by Vini found a significant relationship between family social support and self-care in type 2 diabetes mellitus patients (Malara, 22017).

Another researcher, Muhit, said there was a relationship between family support and dietary compliance in diabetes mellitus sufferers with a p-value of 0.001 < 0.05. According to Muhit, family support is the attitude, acceptance and actions of the family towards sick family members, where the family functions as a support system that always provides help and assistance when needed (Muhith, A., & Siyoto, 2016). Based on the researcher's analysis, each individual's support from their family is different because it depends on the attitudes and actions of the individual in their family (Elina S,et al, 2018). Furthermore, Hardika said, the support that individuals receive will vary due to the structure of the family itself, where not all individuals will live with the nuclear family. The busyness of each family member can reduce the support provided to family members who need it, resulting in low individual motivation to prevent complications that may occur in diabetes mellitus sufferers (Hardika, B. D., & Pranata, 2019),

The importance of participation from various aspects so that social support, family, and efficacy have a significant relationship to preventing complications. In preventing diabetes mellitus, it is hoped that the family and community in the surrounding environment will be involved to maximally prevent complications (Putri, 2021). Family social support with family capabilities. the elderly to care for their feet to prevent foot ulcers. diabetes mellitus at the Kendalsari Community Health Center, Malang City (Ramuar, D. et al, 2022)..

Family and social support are important aspects in diabetes management compliance. A number of correlational studies show that there is a positive and significant relationship between social support and compliance with diabetes mellitus treatment and prevention of diabetic foot ulcers. It is necessary to know the working mechanism of social support which has a direct influence on the health outcomes of DM patients, the use of health services for families, and changes in patient behavior. both DM patients themselves and other family members.

CONCLUSSION

There was an increase in knowledge about diabetes mellitus, self-efficacy, foot care activities and social support after health education interventions were carried out in T2DM patients. Healthy foot care practices have been carried out after health education about foot care in T2DM.

Health education plays a role in preventing foot ulcers in patients with type 2 diabetes mellitus (T2DM).

Conflict of Interest

The authors declare that they have no conflict of interest.

Acknowledgment

In accordance with the publication of proceedings at the Semarang State University, on this occasion we would like to thank all parties who contributed to the writing of research and articles and to the reviewers for your efforts and expertise as reviewers.Your help allows us to meet scheduled times and maintain peer review standards.We greatly appreciate your dedication as the number of manuscripts increases every year.

REFERENCES

Aboobakar, I. F., & Allingham, R. R. (2014). Developments in Ocular Genetics : 2013 Annual Review. *APJO*, *3*(3), 181–193. https://doi.org/10.1097/APO.0000000000000063

Al-Kahfi, R., 1, Palimbo, A., & Marlina*. (2016). Pengaruh Efikasi Diri Dan Dukungan Keluarga Terhadap Pencegahan Kaki Diabetik Pada Pasien Rawat Jalan Diabetes Mellitus Tipe 2 Di Rsud Dr. H. Moch. Ansari Saleh Banjarmasin. *Dlinamika Kesehatan*, *7 (2)*.

Al-rubeaan, K., Almashouq, M. K., Youssef, A. M., & Al-, H. (2017). *All-cause mortality among diabetic foot patients and related risk factors in Saudi Arabia*. 1–15.

Al, C. et. (2019). Factors Associated With Foot Ulcer Self - Management Behaviours Among Hospitalised Patients With Diabetes. *Journal Of Clinical Nursing*.

Al, S. T. et. (2020). Perilaku Pencegahan Terjadinya Komplikasi Diabetik Di Tinjau Dari Self Efficacy Pada Pasien Diabetes Mellitus. *Jurnal Ofhealth Science Community*.

Amelia, R. (2018). Hubungan Perilaku Perawatan Kaki Dengan Terjadinya Komplikasi Luka Kaki Diabetes Pada Pasien Diabetes Melitus Tipe 2 Di Puskesmas Tuntungan Kota Medan. *Talenta Conference Series: Tropical Medicine (Tm), 1 (1)*.

Amir, H., & Munir, N. W. (2021). *Effect of Health Education on Improving the Knowledge among Diabetes Mellitus Patients in the Prevention of Diabetic Ulcer in Regional Hospital of Tidore Island*. *4*(4), 379–384.

Andriyanto, G. (2017). *Pengaruh Pendidikan Kesehatan Tentang Perawatan Kaki Diabetik Terhadap Pengetahuan Perawatan Kaki Pada Diabetes Mellitus Di Rsup Dr. Soeradji Tirtonegoro Klaten*.

Andy Rias, Y. (2016). Hubungan Pengetahuan Dan Keyakinan Dengan Efikasi Diri Penyandang Diabetic Foot Ulcer. *Jurnal Keperawatan Muhammadiyah*, *1*(1), 2016.

Aprilyasari, R. W. (2015). *Hubungan Lama Menderita DM dengan Perilaku Perawatan Kaki Secara Mandiri untuk Mencegah Ulkus Diabetikum*. *2*, 29–35.

Ardi, M. et al. (2014). *Hubungan Kepatuhan Perawatan Kaki Dengan Resiko Ulkus Kaki Diabetesdi Poliklinik Dm Rsu Andi Makkasauparepare*. *4 (1)*.

Ardi, M. et al. (2015). *Hubungan Kepatuhan Perawatan Kaki Dengan Resiko Ulkus Kaki Diabetesdi Poliklinik Dm Rsu Andi Makkasauparepare*. *4(1)*.

Arianti, Yetti, K. and Nasution, Y. (2015). Hubungan Antara Perawatan Kaki dengan Risiko Ulkus Kaki Diabetes di Rumah Sakit PKU Muhammadiyah Yogyakarta. *Muhammadiyah Journal of Nursing*, 9–15.

Astrada, A. (2014). Faktor-Faktor Yang Memengaruhi Terjadinya Luka Kaki Diabetik Pada Pasien Diabetes Mellitus Tipe 2 Di Balai Pengobatan Dan Spesialis Perawatan Luka. *Jurnal ProNers*.

Chawla, S. S., Kaur, S., Bharti, A., Garg, R., Kaur, M., Soin, D., Ghosh, A., & Pal, R. (2019). Impact of health education on knowledge, attitude, practices and glycemic control in type 2 diabetes mellitus. *Journal of Family Medicine and Primary Care*, *8*(1), 261. https://doi.org/10.4103/jfmpc.jfmpc_228_18

Cho, N. H., Shaw, J. E., Karuranga, S., Huang, Y., da Rocha Fernandes, J. D., Ohlrogge, A. W., & Malanda, B. (2018). IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes Research and Clinical Practice*, *138*(24), 271–281. https://doi.org/10.1016/j. diabres, 109119.

Choirunisa, J. and. (2019). Hubungan Dukungan Keluarga dengan Kepatuhan Diet pada Penderita DM Di Ruang Poliklinik RSI Sunan Kudus. *Jurnal Profesi Keperawatan*, *6 (1)*. https://doi.org/10.47679/makein.20207

Depkes Ri. (2018). *Hasil Utama Riset Kesehatan Dasar Tahun 2018. Kementrian Kesehatan Republik Indonesia*.

Diabetes, D. O. F. (2013). Diagnosis and classification of diabetes mellitus. *Diabetes Care*, *36*(SUPPL.1), 67–74. https://doi.org/10.2337/dc13-S067

Dwi yuniar rahmandhani, fery agusman MM, R. H. (2016). Karakteristik, Dukungan Keluarga Dan Efikasi Diri Pada Lanjut Usia Diabetes Mellitus Tipe 2 Di Kelurahan Padangsari, Semarang. *Jurnal Ners LENTERA*, *4 (2)*.

Efriliana, et al. (2018). Karakteristik Pasien Diabetes Melitus Dengan Pengetahuan Tentang Perawatan Kaki Diabetes Melitus. *Dinamika Kesehatan, 9*, 655–668.

Elina Susanti1, Aprida Manurung, L. P. (2018). Hubungan Antara Dukungan Keluarga Dengan Harga Diri Lansia Di Kelurahan Kebun Bunga Kecamatan Sukarami Palembang. *Jurnal Ilmiah Bakti Farmasi*, *3 (1)*, 17–26.

Evans, M., Morgan, A. R., Patel, D., Dhatariya, K., Greenwood, S., Newland-Jones, P., Hicks, D., Yousef, Z., Moore, J., Kelly, B., Davies, S., & Dashora, U. (2021). Risk Prediction of the Diabetes Missing Million: Identifying Individuals at High Risk of Diabetes and Related Complications. *Diabetes Therapy*, *12*(1), 87–105. https://doi.org/10.1007/s13300-020-00963-2

Farmasi, J. S. (2018). *Survei_Risiko_Penyakit_Diabetes_Melitus*. *5*(2), 134–141.

Ferawati, F., & Alfaqih, M. R. (2021). Hubungan Usia, Lama Menderita Diabetes Melitus dengan Kejadian Ulkus Diabetikum pada Penderita Diabetes Melitus. *Jurnal Keperawatan, 13*, 969–

976.

Firmansyah, M. R. (2019). *Mekanisme Koping Dan Efikasi Diri Dengan Manajemen Perawatan Diri Pasien Diabetes Melitus Tipe 2 M . Ramadhani Firmansyah Program Studi Ilmu Keperawatan , STIK Siti Khadijah Palembang Pendahuluan Diabetes melitus (DM) adalah M . Ramadhani Firmansyah per*. *11*.

Fitria, N., van Asselt, A. D., & Postma, M. J. (2019). Cost-effectiveness of controlling gestational diabetes mellitus: a systematic review. *The European Journal of Health Economics, 20 (3)*, 407–417.

Fitrika, Y., Syahputra, K. Y., & Rizky, D. G. (2018). *Pengaruh Diabetes Self Management Education (DSME) Terhadap Kejadian Ulkus Diabetik Pada Pasien Rawat Jalan DM Tipe 2 di RSUD Meuraxa Banda Aceh*. *9623*, 25–30.

Fonna, T. R., Siregar, W. Y. M., & Putri, B. I. (2023). Diabetes Mellitus dengan Ulkus Kaki Diabetik. *GALENICAL : Jurnal Kedokteran Dan Kesehatan Mahasiswa Malikussaleh*, *2*(1), 79. https://doi.org/10.29103/jkkmm.v2i1.9939

FR, Y. (2020). Data Populasi Penduduk Muslim 2020: Indonesia Terbesar di Dunia.'. *2020*.

Frekuensi, P., Menurunkan, K., Tidur, K., Diabetes, P., & Penelitian, J. (2015). *Jurnal penelitian keperawatan*. *1*(2).

Graves, N. (2021). *A narrative review of the epidemiology and economics of chronic wounds*. *September*. https://doi.org/10.1111/bjd.20692

Ha, M., Hu, J., Petrini, M. A., & McCoy, T. P. (2014). The effects of an educational self-efficacy intervention on osteoporosis prevention and diabetes self-management among adults with type 2 diabetes mellitus. *Biological Research for Nursing*, *16 (4)*, 357–367.

Hardianti, D., Adi, M. S. and Saraswati, L. (2018). Description of factors related to severity of diabetic mellitus patient type 2 (Study in Rsud Kota Semarang). *Jurnal Kesehatan Masyarakat (e-Journal)*, *6(4)*, 132–140.

Hardika, B. D., & Pranata, L. (2019). Pendampingan senam lansia dalam meningkatkan kualitas tidur. *Ournal of Character Education Society*, *2 92)*.

Hidayat, R., 1*, Soewondo, P., 2, Irawaty, D., & 3. (2022). Pengaruh Edukasi Dan Perawatan Kaki Terhadap Pencegahan Luka Kaki Diabetik. *Malahayati Nursing Journal*.

IDF. (2024). *Diabetes Atlas*.

Ismonah, I. and Octaviani, A. P. (2019). Hubungan Dukungan Keluarga Terhadap Perawatan Kaki Untuk Mencegah Kaki Diabetik Pada Pasien Dm Tipe 2 Di Rsud Ungaran', KOSALA. *Jurnal Ilmu Kesehatan*, *7 (2)*, 97–102.

Jannah, N., 1, & Ayudiah Uprianingsih. (2020). Pengaruh Perawatan Kaki Terhadap Pencegahan Ulkus Kaki Diabetik Di Kota Bima. *PROSIDING NASIONAL UNIMUS*, *3*.

Jin, Q., & Ma, R. C. W. (2021). Metabolomics in diabetes and diabetic complications: Insights from epidemiological studies. In *Cells* (Vol. 10, Issue 11). https://doi.org/10.3390/cells10112832

Kishore, S., Upadhyay, A., & Jyotsna, V. (2015). Categories of foot at risk in patients of diabetes at a tertiary care center: Insights into need for foot care. *Indian Journal of Endocrinology and*

Metabolism, *19*(3), 405. https://doi.org/10.4103/2230-8210.152789

Kusumaningrum, N. S. D. and Asriningrat, R. (2016). 'Identifikasi Risiko Diabetic Foot Ulcer (DFU) Pada Pasien Dengan Diabetes Mellitus. *Jurnal Luka Indonesia*, 65–70.

Mahdalena, M. (2016). *Effectivity of Foot Care Education Program in Improving Knowledge , Self-Efficacy and Foot Care Behavior among Diabetes Mellitus Patients in Banjarbaru , Indonesia Effectivity of Foot Care Education Program in Improving Knowledge , Self-Efficacy and Foot* . *11*(2), 56–60. https://doi.org/10.21109/kesmas.v11i2.583

Mahdalena, & Purwanti Ningsih, E. S. (2016). Effectivity of foot care education program in improving knowledge, self-efficacy and foot care behavior among diabetes mellitus patients in Banjarbaru, Indonesia. *Kesmas*, *11*(2), 56–60. https://doi.org/10.21109/kesmas.v11i2.583

Makki Awouda1, F. O. (2014). *'Effects of Health Education of Diabetic Patient's Knowledge at Diabetic Health Centers.'*

Makkiawouda, F. O., Elmukashfi, T. A., & Al-tom, S. A. H. (2014). *Effects of Health Education of Diabetic Patient ' s Knowledge at Diabetic Health Centers , Khartoum State , Sudan : 2007-2010*. *6*(2), 221–226. https://doi.org/10.5539/gjhs.v6n2p221

Malara, V. P. R. E. K. (22017). Hubungan Dukungan Sosial Dan Motivasi Dengan Perawatan Mandiri Pada Pasien Diabetes Melitus Tipe 2 Di Poliklinik Penyakit Dalam Rsud Mokopido Toli-Toli. *E-Journal Keperawatan (e-Kp*, *5 (1)*.

McKenzie, J. F., Neiger, B. L., & Thackeray, R. (2017). *Planning, Implementing, and Evaluating Health Education Programs: A Primer*.

Medical record Pringsewu Hospital. (2023). *Health profil Pringsewu Hospital*.

Mitra J, Haque, H. F., Afroz, F., Afroze, S. R., , P., Rahim, M. A., Ahmed, A. S., & Musa, A. K. M. (2017). Frequency and risk factors of diabetic complications among selected group of diabetic patients: real-life scenario from a developing country, Bangladesh. *BIRDEM Medical Journal*, *7(2)*, 143–147.

Mufidhah, M. (2019). *Gambaran Perilaku Perwatan Kaki Pada Penderita Diabetes Mellitus Di Puskesmas Ungaran'*.

Muhith, A., & Siyoto, S. (2016). *Pendidikan Keperawatan Gerontik*. yogyakarta: Andi Offset.

Munali et al. (2019). Critical Medical And Surgical Nursing Journal (Jurnal Keperawatan Medikal Bedah Dan Kritis). *Jurnal Keperawatan Medikal Bedah Dan Kritis*, *8*(1), 45–55.

Murdiyanti, D., & Putri, P. (2019). *Diabetes Melitus Meningkatkan Efikasi Diri Penderita Diabetes Melitus Health Education 5 Pillars Of Management Of Diabetes Melitus Improving Self-Efication Diabetes Melitus Patients*. 1–6.

Mustafa, I. A. H. (2016). Determinan Epidemiologis Kejadian Ulkus Kaki Diabetik Pada Penderita Diabetes Mellitus Di Rsud Dr. Chasan Boesoirie Dan Diabetes Center Ternate. *Universitas Airlangga.*

N, P. O., P, R. D. W. P., D, S. K., Razni, S., No, P., & Banjarmasin, K. (2022). *Health Belief (Hbm) Untuk Menganalisis Kepatuhan Pasien Diabetes Mellitus*. *2*(2), 61–68.

Neli, H. (2015). 'Faktor-Faktor Yang Berhubungan Dengan Kejadian Ulkus Kaki Diabetes Mellitus

Di Klinik Diabetes Mellitus Tahun 2015. *Jurnal Ilmu Kesehatan*.

Ngurah, I. G. K. G. and Sukmayanti, M. (2014). *fikasi Diri pada Pasien Diabetes Melitus Tipe 2', Keperawatan Politeknik kesehatan denpasar*. *21*, 6–7.

Notoatmodjo, S. (2012). Promosi Kesehatan dan Perilaku Kesehatan (Health Promotion and Health Behavior). *Rineka Cipta.*

Pemda, K., & Pringsewu, K. (2022). Profil Dinkes Kabupaten Pringsewu. *Paper Knowledge . Toward a Media History of Documents*.

PERKENI. (2015). *Pengolahan dan Pencegahan Diabetes Melitus Tipe 2 Di Indonesia 2015*.

Permana, Y. I., Kesehatan, F. I., & Surakarta, U. M. (2017). *Hubungan Antara Lama Sakit Dengan Tingkat Distress Pada Pasien Diabetes Mellitus*.

Pratama, D. A., Sukarni and Nurfianti, A. (2019). Analisis Faktor-Faktor Terjadinya Luka Kaki Berulang Pada Pasien Diabetes Melitus Di Klinik Kitamura Dan RSUD Dr. Soedarso Pontianak. *Journal Proners*, *4 (1)*, 1–2. https://doi.org/Hardianti, D., Adi, M. S. and Saraswati, L. D. (2018) 'Description of factors related to severity of diabetic mellitus patient type 2 (Study in Rsud Kota Semarang)', Jurnal Kesehatan Masyarakat (e-Journal), 6(4), pp. 132–140

Pratama, P. A. (2016). Pengaruh Pendidikan Kesehatan Terhadap Pengetahuan dan Sikap Pasien tentang Pengelolaan Diet Diabetes Mellitus di Puskesmas Boyolali I. *Universitas Muhammadiyah Surakarta*.

Primanda, Y., Putra, P. B., Soleman, S. R., & Arba, W. M. (2017). *The Effect of the Foot Care Education Program on Knowledge and Self-Efficacy Among Family of Diabetes Mellitus Patients in PKU Muhammadiyah Gamping Yogyakarta Indonesia*. *23*(12), 12619–12622. https://doi.org/10.1166/asl.2017.10830

Purwanti. (2017). Analisis Faktor Dominan Yang Mempengaruhi Kepatuhan Pasien Dm Tipe 2 Dalam Melakukan Perawatan Kaki Lina. *Jurnal Ilmiah Kesehatan, 10 (1)*.

Putri, N. I. I. (2021). *Hubungan Antara Pengetahuan Dan Sikap DenganUpaya Kepatuhan Diet Pada Penderita DiabetesMellitusTipe2Di Surakarta.*

Rahman, H. F., & Sukmarini, L. (2017). *Efikasi Diri , Kepatuhan , dan Kualitas Hidup Pasien Diabetes Melitus Tipe 2 (Self Efficacy , Adherence , and Quality of Life of Patients with Type 2 Diabetes)*. *2*, 108–113.

Ramuar, D. & Wibowo, R. C. A., Supriyadi, S. (2022). *Hubungan Dukungan Sosial Keluarga dengan Kemampuan Diri Lansia dalam Merawat Kaki untuk Mencegah Ulkus Kaki Diabetes Mellitus di Puskesmas Kendalsari Kecamatan Lowokwaru Kota Malang (Doctoral dissertation*.

Rembang, V., P., Katuuk, M., E. and Malara, R. (2017). Hubungan Dukungan Sosial Dan Motivasi Dengan Perawatan Mandiri Pada Pasien Diabetes Dalam RSUD Mokopido Toli-Toli. *E-Journal Keperawatan*, *5 (1)*, 10. https://doi.org/10.37831/jik.v7i2.173.

Sa'adah, N. (2016). Hubungan Keyakinan Kemampuan Diri (self-efficacy) terhadap Perilaku Perawatan Kaki pada Pasien Diabetes Melitus. *Naskah Publikasi,*.

Safruddin, & Hidayat2, R. (2018). Analisis Faktor Yang Mempengaruhi Kejadian Ulkus Kaki Pada Pasien Diabetes Melitus. *Urnal Ilmiah Kesehatan Diagnosis, 12 (1)*.

Sari, N. N., & H. (2018). Faktor–Faktor Yang Mempengaruhi Kemandirian Merawat Kaki Pada Pasien Diabetes Mellitus Tipe II. *Jurnal.Unw.Ac.Id*, *1(2)*.

Saurabh, S., Sarkar, S., Selvaraj, K., Kar, S. S., Kumar, S. G., & Roy, G. (2014). *Brief Communication Effectiveness of foot care education among people with type 2 diabetes in rural Puducherry , India*. *18*(1), 106–111. https://doi.org/10.4103/2230-8210.126587

Setianingsih, R. sari dewi. (2017). *Pengaruh Pendidikan Kesehatan Perawatan Kaki Diabetik Dengan Metode Demonstrasi Terhadap Kemampuan Merawat Kaki Pada Pasien Diabetes Melitus Di Rsup Dr Soeradji Tirtonegoro Klaten*.

Setiawan, H. et al. (2020). Kualitas Hidup Ditinjau dari Tingkat Kecemasan Pasien Penderita Ulkus Diabetikum. *Majalah Kesehatan Indonesia*, 333–338.

Srimiyati, S. (2018). Pengetahuan pencegahan kaki diabetik penderita diabetes melitus berpengaruh terhadap perawatan kaki. *MEDISAINS*, *16*(2), 76. https://doi.org/10.30595/medisains.v16i2.2721

Sun, H., et al. (2021). *IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045., 2022,*.

Supardi, E. (2020). *Hubungan Penggunaan Alas Kaki Dengan Luka Kaki Diabetik Di Klinik Perawatan Luka Kota Makassar*. *15 (1)*.

Suryati, I., Primal, D., & Pordiati, D. (2019). *P-ISSN : 2355-9853 Hubungan Tingkat Pengetahuan Dan Lama Menderita Diabetes Mellitus (Dm) Dengan Kejadian Ulkus Diabetikum Pada Pasien Dm Tipe 2 P-ISSN : 2355-9853*. *6*, 1–8.

Świątoniowska, N., Sarzyńska, K., Szymańska-Chabowska, A., & Jankowska-Polańska, B. (2019). The role of education in type 2 diabetes treatment. *Diabetes Research and Clinical Practice*, *151*, 237–246.

Vadila, A., Izhar, M. D., & Nasution, H. S. (2021). Faktor-Faktor Kejadian Diabetes Melitus Tipe 2 Di Puskesmas Putri Ayu. *Media Kesehatan Politeknik Kesehatan Makassar*, *16*(2), 229–237.

Windani Mambang Sari, C., Haroen, H., & Nursiswati, N. (2016). Pengaruh Program Edukasi Perawatan Kaki Berbasis Keluarga terhadap Perilaku Perawatan Kaki pada Pasien Diabetes Melitus Tipe 2. *Jurnal Keperawatan Padjadjaran*, *v4*(n3), 305–315. https://doi.org/10.24198/jkp.v4n3.10

Z. Tao, A. Shi, J. Z. (2015). *Epidemiological perspectives of diabetes, Cell Biochem. Biophys*.

Zhang, P., Lu, J., Jing, Y., Tang, S., Zhu, D., & Bi, Y. (2017). *Annals of Medicine Global epidemiology of diabetic foot ulceration : a systematic review and meta-analysis*. *3890*. https://doi.org/10.1080/07853890.2016.1231932

Zibaeenezhad, M. J., Aghasadeghi, K., Bagheri, F. Z., Khalesi, E., Zamirian, M., Moaref, A. R., & Abtahi, F. (2015). The effect of educational interventions on glycemic control in patients with type 2 diabetes mellitus. *International Cardiovascular Research Journal*, *9*(1), 17–21.