Family Support in Diabetic Foot Prevention Efforts: A Correlation Research

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ABSTRACT
Diabetes mellitus is a metabolic disease with increased blood sugar levels, caused by impaired insulin secretion and can cause complications. Complications that often occur in Diabetes Mellitus patients are diabetic foot wounds and if not treated immediately, they can become infected and require amputation to remove infected tissue. Foot care behavior is part of primary prevention efforts that aim to prevent wounds and chronic complications in patients with Diabetes Mellitus. Family participation in foot care is needed, because it can encourage the behavior of people with Diabetes Mellitus to carry out foot care. The purpose of this study was to determine family support in the success of efforts to prevent diabetic ulcers. This study used 36 respondents of DM patients who lived with their families using the HDFSS instrument to measure family support and foot care efforts instrument to measure diabetic foot prevention. The results showed a correlation between family support and behavior for routine control to health services, taking DM medication regularly and efforts to prevent Diabetes Mellitus feet.

INTRODUCTION

Diabetes Mellitus is a metabolic condition characterized by high blood sugar levels due to decreased insulin synthesis or action, or even both, which can lead to major complications. This is due to chronically rising blood glucose levels, which harm blood vessels, neurons, and other internal systems [1]. One of common complications for diabetic patients is diabetic foot ulcers. Immediate treatment is necessary to prevent deterioration and amputation of contaminated tissue, saving the patient's body parts and life [2]. People with Diabetes Mellitus are frequently preoccupied with their blood sugar levels, heart health, and cholesterol, but forget to pay adequate attention to their feet. In most of cases, this is because they are illiterate of the potential of losing their feet [3].

The International Diabetes Federation (IDF) reported that the global prevalence of Diabetes Mellitus in 2019 was at least reached 463 million among people aged 20 to 79 years old, accounting for 9.3% of the entire population of that age range. IDF also identified 10 countries with the highest number of sufferers in the population, with the top three being China with 116.4 million sufferers, India with 77 million, and the United States with 31 million, while Indonesia is ranked seventh with 10.7 million sufferers [4].

The prevalence of foot ulcers due to Diabetes Mellitus reaches 15%, with a 30% of these patients having risk of amputation and the other 32% having risk of death. Around 13% of diabetic foot ulcers patients in Indonesia are getting treatment in hospitals, whereas roughly 26% of diabetics undergo outpatient therapy. [5].

Diabetic ulcers can be avoided if individuals learn to care for their feet on a regular basis. Nurses can also contribute to this endeavor by screening and monitoring their patients and collaborating with other healthcare practitioners. Furthermore, vascularization is one of the factors that influences the wound healing process because once it is disrupted, blood flow in the body is impacted, causing all of the body's needs such as nutrition, oxygen, or drugs to be unable to reach the tissue in each extremity, thereby inhibiting the healing process [6]. Moreover, neuropathy and high-risk foot are another two causes of ulcers.

Foot care is part of primary preventive efforts to avoid wounds and chronic consequences in patients with Diabetes Mellitus. People with Diabetes Mellitus must understand how to properly care for their diabetic foot in order to avoid gangrene and surgery [7]. Preventive foot care entails thoroughly washing the feet, drying them, and carefully applying lotion so that the feet do not become moist down to the gaps between the toes. It is also vital to evaluate the foot on a regular basis for symptoms of redness, blisters, fissures, calluses, or ulcerations. Regular foot care reduces the chance of getting diabetic foot ulcers by 50-60% [8].

Family engagement in foot care is extremely important since it helps to motivate Diabetes Mellitus patients to practice foot care where family members can serve as reminders and supporters during foot care. Moreover, Diabetes Mellitus is a hereditary condition that puts other family members at risk, thus family engagement is crucial for them [9]. The study's finding [10] shown a link between family support for foot care and Diabetes Mellitus in patients. The presence of family support might result in changes in behavior and emotional traits as individuals with Diabetes Mellitus can get treatment, particularly in terms of blood sugar management and regular visits to health-care providers.

The study's findings [11] revealed a link between family support and foot care, implying that improved family support would lead to better foot care for Diabetes Mellitus patients and fewer problems. Patients can prevent diabetic foot issues by getting frequent check-ups at health care facilities, taking their diabetes medication as prescribed, and practicing routine foot care. The goal of this study was to examine the association between family support and regular medication consumption, family support and frequent check-ups at health care facilities, and family support and diabetic foot care activities.

METHODS

The research was ethically tested on March 18, 2024, under the number 753/EC/III/2024. The research involved patients who were actively registered to participate in the Chronic Disease Management Program (PROLANIS) and lasted one day. Data collection began with blood sugar and blood pressure examinations, followed by interviews and questionnaire completion. The research population consisted of 37 respondents selected using the total sampling technique, with the exclusion of those who did not live with their families. One respondent lived alone and was thus not employed as a respondent. Therefore, the total number of respondents was 36. The data was obtained using the HDFSS (Hensarling Diabetes Family Support Scale) questionnaire to assess family support, which was validated with 25 question items and reliability values (Alpha Cronbach 0.940). While the foot care instrument has been employed in previous studies, notably [12], with validity test results (r> r-table = 0.301). While the reliability test yielded a Cronbach's Alpha score of 0.786, which is higher than 0.6. This instrument consists of 11 questions and 7 question indicators, which ask respondents how they check the status of their feet, maintain foot cleanliness, maintain foot moisture, trim their toenails, wear footwear, check their footwear, and see their doctor on a regular basis. Finally, the bivariate data analysis was used to assess the correlation between variables using the Pearson correlation test.

RESULTS AND DISCUSSION

a. Characteristics of respondents

Table 1. Average Characteristics of Respondents Based on Age, GDP Results, and Length of Time Diagnosed with Diabetes Mellitus (n=36)

Characteristics	n	Mean	Minimum	Maximum	SD
Age	36	59,44	46	69	5,310
Fasting Glucose	36	164,50	110	211	21,349
Length of time	36	4,81	2	7	1.283

Table 1 shows that the average age of respondents in the study was 59.44 years, which ranged between 46-69 years, and the standard deviation was 5.310 years. While the average fasting glucose result was 164.50 mg/dl, which ranged between 110-211 mg/dl, and the standard deviation was 21.349 mg/dl. Finally, the average duration of suffering from Diabetes Mellitus was 4.81 years, the minimum was 2 years, the maximum was 7 years and the standard deviation was 1.283 years.

Table 2. Characteristics of Respondents Based on Gender, Education Level, Routine Check-ups, Medication Habits (n=36)

Characteristics	Frequency (f)	Percentage (%)
Sex		
Male	4	11,1
Female	32	88,9
Total	**36**	**100,0**
Education Level		
No school degree	1	2,8
Elementary	13	36,1
Junior High School	17	47,2
Senior High School	5	13,9
Total	**36**	**100,0**

According to Table 2, the majority of respondents (32, 88.9%) are female. According to education level, the majority of respondents had completed junior high school, with 17 (47.2%).

Table 3. Analysis of the Relationship between Family Support and Diabetic Foot Prevention Efforts (n=36)

Family Support	Foot Care Effort				Total	r	P Value
	Good		Lacking				
	F	%	F	%			
High	31	86,1%	0	0,0%	31	0.880**	0,000
Low	1	2,8%	4	11,1%	5		
Total	32	88,9%	4	11,1%	36		

According to table 3, there are 31 respondents (86.1%) with strong family support and good foot care efforts, 1 respondent (2.8%) with poor family support but good foot care efforts, and 4 respondents with poor family support and lack foot care efforts (11.1%). The research revealed a significant connection (p-value <0.05) between family support and foot care efforts. The calculated correlation coefficient value, r = 0.880 **, indicating a very strong association with a positive relationship direction.

Table 4. Analysis of the Relationship between Family Support and Routine Check-ups to Health Services (n=36)

Family Support	Routine Check-ups to Health Services				Total	r	P Value
	Routine		Not routine				
	F	%	F	%			
High	31	86,1%	0	0,0%	31	1.000**	0,000
Low	0	0,0%	5	13,9%	5		
Total	31	86,1%	5	13,9%	36		

Table 4 shows that 31 respondents (86.1%) had high family support with routine control to health services, 0 had low family support with routine control, and 5 had low family support with routine control to non-routine health services. The research revealed a significant connection (p-value < 0.05) between family support and routine check-ups to health care. The correlation coefficient value obtained was r = 1,000 **, indicating a very strong positive association.

Table 5. Analysis of the Relationship between Family Support and the Habit of Taking Diabetes Mellitus Medication (n=36)

Family Support	Habit of taking medication				Total	r	P Value
	Yes		No				
	F	%	F	%			

High	29	80,1%	1	2,7%	30	0.683**	0,000
Low	2	6%	4	11,2%	6		
Total	31	86,1%	5	13,9%	36		

Table 5 shows that 29 respondents (80.1%) had high family support for taking DM medication, 2 respondents (6%) had low family support but good habit of taking the medication, and 4 respondents (11.2%) had low family support and not taking medication on a regular basis. The research found a significant connection (p-value < 0.05) between family support and routine access to health care services. The correlation coefficient value found was r = 0.683 **, indicating a very significant association in a positive direction.

1. **Age**

Risk factors for Diabetes Mellitus emerge beyond the age of 45. At this age, a person's lifestyle is changed, where physical activity as well as body weight rise, while muscle mass diminishes, and aging causes shrinking of β cells. Furthermore, the growing incidence of Diabetes Mellitus among those over the age of 40 is due to an increase in glucose intolerance. The mechanism underpinning the greater risk of Diabetes Mellitus in older people is caused by an increase in the content of fat in the body, which accumulates in the belly, resulting in central obesity. Furthermore, central obesity can cause insulin resistance, which is the first stage of Diabetes Mellitus [13].

2. **Fasting blood sugar level**

Fasting blood sugar is the blood sugar level measured after a person has fasted for 6-10 hours. During fasting, blood sugar levels drop, producing a reduction in insulin production, which can lead to increased activity of counter-insulin hormones such as glucagon and catecholamines, resulting in glycogen breakdown. After a few hours of fasting, glycogen levels will start to deplete. Reduced insulin in circulation causes the release of fatty acids [14]. Fatty acids can be degraded to yield energy and ketones. Ketones are invisible molecules that may enter the circulation and provide energy to muscles and other cells [15]. According to the research data, the average fasting blood sugar level is 200.33 mg/dL. Thus, the fasting sugar level falls into the high group [16]. This can be caused by fasting for an extended period of time, patients failing to follow the DM diet, or irregular DM medication use. Controlling blood sugar levels at least once every two weeks will help avoid consequences like diabetic ulcers.

3. **The length of time diagnosed with Diabetes Mellitus**

According to research, the average length of time a person has diabetes is 4-5 years. The length of time diagnosed with Diabetes Mellitus is also connected to the reduction in pancreatic beta cells, which causes difficulties in general in individuals with a 5- to 10-year disease duration. Decreased pancreatic beta cell activity can affect insulin production [17]. Reduced insulin secretion in the blood can inhibit glycolysis in cells, resulting in glucose not being absorbed, which can lead to increased glucose storage in the blood vessels and hyperglycemia [18]. According to the findings of the study [19], patients with Diabetes Mellitus who had been suffering for more than 5 years experienced changes in attitudes and behavior toward managing Diabetes Mellitus, such as becoming bored with medication, not regulating their diet, and rarely engaging in physical activity (exercise) because they believed that their daily activities are already considered exercises. Patients who had diabetes for more than three years required family help in regulating blood sugar levels to avoid complications, since diabetes ulcers are common complications in persons who have had the disease for more than three years.

4. **Sex**

The research results show that the majority of respondents with Diabetes Mellitus were female (32 respondents, 88.9%). Supported by study [20], which discovered a link between gender and the risk of diabetes mellitus, with females experiencing more diabetes than males. The increased occurrence of Diabetes Mellitus in women can be attributed to variations in body composition and sex hormone levels between adult women and men. Women possess greater fat tissue than males. This is seen in the variation in typical fat levels between adult men and women, where males have 15-20%

and women have 20-25% of body weight. In menopausal women, a drop in estrogen hormone concentration produces an increase in body fat stores, particularly in the abdomen area, increasing the release of free fatty acids. Both of these conditions result in insulin resistance [21].

Women are more prone than men to develop Diabetes Mellitus due to their increased risk of increasing body mass index. Achieving an optimum nutritional status is one strategy for diabetic individuals to reduce their blood sugar levels since obesity is a risk factor for the development of high blood sugar levels because beta cells in the islets of Langerhans become less responsive to stimuli or sugar level rise. Furthermore, obesity lowers the amount of insulin receptors in cells throughout the body [22] resulting in monthly cycle syndrome (premenstrual syndrome). Women are more likely to suffer from diabetes after menopause because hormonal changes promote the accumulation of body fat [23]. This is consistent with the assumption [24] that women are more prone than men to develop Diabetes Mellitus due to their increased fat content. In addition, women usually exercise less, making them more susceptible to the condition.

5. Education level

Education is a crucial predictor for sustaining blood sugar management, managing symptom difficulties, and avoiding consequences. A person's degree of education influences how they think and behave while dealing with a situation. However, having a better degree does not ensure that the experience obtained would be high, which will influence the thinking and conduct towards Diabetes Mellitus [25]. This statement is consistent with [26] who stated that not all people who have a higher educational background care about their health. Some of them ignore their health, particularly when it is related to work and busy activities that cause changes in lifestyle, eating habits, and lack of physical activity.

6. Analysis of the relationship between family support and diabetic foot prevention efforts

This study conducted a correlation analysis between the independent variable of family support and the dependent variables of routine access to health services, medication use, and foot care activities. As a result, there is a link between family support and foot care efforts, as well as frequent health-care visits and diabetes medication use. However, the variable's closest association is the one between family support and routine access to health care [27].

Diabetes Mellitus patients may obtain educational, evaluation, instrumental, and emotional assistance from their families [28]. Family support that is frequently provided by families to Diabetes Mellitus patients includes informational support such as advice to perform health condition checks, assessment support through reminders to perform health checks, as well as instrumental support in the form of assisting with medical expenses, and emotional support in the form of providing a sense of security and comfort when gathering with family [29].

Family support is also impacted by socioeconomic factors such as income or work status and education level. Family support in the middle class tend to be more democratic and equitable, while family support in the lower middle class is more authoritarian and autocratic. Another factor to consider is the level of education; the greater the level of education, the better the potential of providing assistance to sick family members [30].

Diabetes Mellitus patients who adhere to their regular check schedule with their doctors are able to control their blood sugar levels, since routine check can aid in the healing process. Diabetes Mellitus patients who do not maintain regular management have a greater difficulty in understanding the progression of their health, which increases the risk of complications [31].

Several factors influence compliance with the regular check schedule with their doctors, including information, level of education, pain and treatment, beliefs, attitudes, and personality, social support, healthy behavior, as well as advice from health professionals. People with diabetes mellitus may struggle to adhere to the management plan. Thus, encouragement from family or other people has a significant impact on their degree of compliance in carrying out control and enduring a series of treatments. Furthermore, the patient must have faith in his ability to go through their healing journey, even if it is really tough [32]. Noncompliance with treatment in people with diabetes mellitus might raise the risk of complications and advancement of the disease. Routine control can be done by activities in health services such as PROLANIS, which include exercise, blood pressure checks, blood sugar checks, doctor consultations, education, and medication administration [33]

Diabetic ulcers can be avoided if individuals learn to care for their feet on a regular basis. Nurses can also contribute to this endeavor by screening and monitoring their patients and collaborating with other healthcare practitioners. Vascularization is one of the factors that influences the wound healing process because once it is disrupted, blood flow in the body is impacted, causing all of the body's needs such as nutrition, oxygen, or drugs to be unable to reach the tissue in each extremity, thereby inhibiting the healing process. Neuropathy and high-risk foot are another two causes of ulcers [6]. Other causes of ulcers include neuropathy and vulnerable feet [34]. Neuropathy can produce foot insensitivity and form changes as a result of aberrant walking habits. In individuals with neuropathy, improper shoes, walking barefoot, or acute traumas can create chronic wounds, whereas lack of feeling, foot deformities, and decreased joint motion can result in aberrant biomechanics and thickened skin (calluses). As a result, peripheral blood vessel abnormalities develop with moderate trauma and discomfort. However, people with neuropathy and ischemia do not experience similar symptoms because ischemia happens in the blood vessels [11][35].

Diabetic ulcers are caused by a lack of regular glucose management, peripheral neuropathy (LOPS), smoking habits, foot deformities, calluses, PAD (peripheral arterial disease), a history of prior foot ulcers, amputation, as well as DM complications. These risk factors, however, can be avoided by ensuring that diabetic foot care treatment maintains proper wound vascularization. There are five things that may be done to prevent diabetic feet: routine inspection of feet at risk, identification of feet at risk, education for patients, families, or other health services, wearing proper footwear, and the necessary therapy for prevention [17][36].

Foot care in diabetic patients is one of the most important preventative measures against foot ulcers. The very first step that must be performed in foot care is to discover foot problems early. Patients need to have a thorough understanding of diabetic foot care in order to avoid gangrene ulcers and amputation [35]. Improving foot care habit is one of the most effective methods for reducing diabetes-related foot ulcers [37]. Efforts to keep blood sugar levels near to normal and avoid foot ulcers depend on the patient's knowledge of recognizing their illness. Knowledge is strongly tied to the behavior they will take [31].

Treatment compliance refers to the patient's adherence to the prescribed pharmaceutical requirements for time, dose, and frequency. Its success is determined by the patient-healthcare provider interaction and social support. While noncompliance with treatment can be caused by a variety of circumstances, including taking too much medicine which causes the patient to become confused and afraid to take the medicine, forgetting the type of medicine and its use, socioeconomic problems due to a lack of transportation to the hospital, a lack of family support because no one attends the check-up, boredom, running out of medicine before the check-up, or the body improving to the point that the patients assume a check-up is no longer necessary [7][24].

CONCLUSIONS

Family support is associated with routine health care, medication adherence, and one's independent foot care efforts. However, the association between family support and regular health ceck is particularly substantial when compared to the other factors.

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