



## The Relationship Between Diabetes Self-Management and Blood Glucose Control in Patients With Type 2 Diabetes Mellitus in Ulee Kareng Subdistrict, Banda Aceh

Saminan<sup>1\*</sup>, Naufal Rabbany<sup>2</sup>, Zahratul Aini<sup>3</sup>, Zulkarnain<sup>1</sup>, Cut Murzalina<sup>4</sup>

<sup>1</sup>Division of Physiology, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh

<sup>2</sup>Undergraduated Student, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh

<sup>3</sup>Division of Family Medicine, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh

<sup>4</sup>Division of Clinical Pathology, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh

\*Corresponding Author: saminanfis\_05@unsyiah.ac.id

### Abstract

Diabetes mellitus is a type of chronic disease that is non-transmitted. Aceh province is the province with the seventh-highest prevalence of diabetes mellitus in Indonesia at 2.4%. People with type 2 diabetes mellitus are at risk of various complications and can cause death. Self-management of diabetes is one of the things that can be done by people with diabetes mellitus in controlling various complications. This study aimed to find out the relationship between diabetes self-management and blood glucose control of type 2 diabetes mellitus patients in Ulee Kareng Subdistrict, Banda Aceh. This type of sampling method in this research was cross-sectional with the number of samples in this study as many as 88 respondents. The study was conducted using the DSMQ questionnaire filling method to assess diabetes self-management level and blood glucose level value when respondents assess blood glucose control. The results of the study obtained are 30.7% of respondents have a good level of diabetes self-management, 44.3% enough, and 25% bad. As for blood glucose control, 65.9% of respondents had uncontrolled blood glucose levels, and 34.1% controlled. The results of the chi-square test obtained a p-value of 0.000 and the spearman correlation test obtained a p-value of 0.000, as well as a correlation coefficient of 0.492. Based on the data analysis, it can be concluded that there is a significant relationship between moderate and unidirectional levels between diabetes self-management and blood glucose control of type 2 diabetes mellitus patients in Ulee Kareng Subdistrict, Banda Aceh.

*Keywords: Blood glucose, chronic disease, diabetes mellitus, diabetes self-management*

### Background

Diabetes mellitus is a type of chronic and non-transmitted disease (Perkeni, 2019). The International Diabetes Federation (IDF) in the diabetes atlas (2019) stated that as many as 463 million people worldwide (aged 20-79 years) are diagnosed with diabetes. The number of people with diabetes in Indonesia is estimated at 10.7 million people. Based on these figures, Indonesia is the seventh-ranked country in the world with the highest prevalence of diabetics (IDF, 2019). The results of Basic Health Research (Riskesdas) by the Ministry of Health (Kemenkes) also mentioned that Aceh Province is the province with the seventh-highest prevalence of diabetes mellitus in Indonesia with a percentage of 2.4% in 2018 (Riskesdas, 2018).

Type 2 diabetes mellitus is a disease caused by the disruption of glucose

metabolism system that can cause various chronic complications (Sofais, 2018). This disease can affect all aspects of the patient's life and with improper treatment and control, type 2 diabetes mellitus will cause complications in various systems of the patient's body to cause death (Sulistria, 2013). The basic thing that can be done to prevent this from happening is to control blood glucose levels in the body (Hanindyastiti and Insiyah, 2017). Some previous studies on the condition of blood glucose control levels in Banda Aceh obtained poor results, namely, the majority of people with diabetes mellitus in Banda Aceh have poor or uncontrolled blood glucose control levels (Ramadhan and Hanum, 2017; Zuqni, 2019).

Diabetes self-management is an independent action performed by diabetic patients to control diabetes suffered

(Sugiyama *et al.*, 2015). Aspects of self-management include dietary activities, physical activity, monitoring of blood glucose levels, adherence to medication, and foot care (Huang *et al.*, 2014). Effective self-management in diabetic patients is an important thing to do to improve the achievement of the goal of managing type 2 diabetes mellitus. Some factors that can affect diabetes self-management, including knowledge, emotional, lifestyle, motivational, and cultural factors (Schulman *et al.*, 2016). Cultural factors greatly influence the treatment of diabetes mellitus. Indonesia, especially Aceh is a Muslim-majority area that has several cultures that develop in the community such as fasting every Ramadhan and "meugang" activities conducted at the time of welcoming Eid to inhibit proper diabetes therapy and the recommended diabetes diet pattern should be adjusted to that culture (Marzuki, 2014; Schulman *et al.*, 2016). Also, the fact that some types of insulin come from pigs can lead to the emergence of the perception that insulin is haraam to be used for the treatment of diabetes mellitus in Muslims (Fox and Kilvert, 2010). This of course can also affect the level of self-management of diabetic mellitus in Indonesia.

Based on data from the Banda Aceh City Health Office in 2018, it was reported that type 2 diabetes mellitus was ranked as the sixth most outpatient disease in the Banda Aceh Public Health Center (Puskesmas) with 6,507 cases (7.4%) (Dinkes Banda Aceh, 2019). In other studies, only about 27.7% of people with diabetes mellitus in endocrine polyclinics of RSUDZA have good diabetes self-management (Zuqni, 2019). Based on research conducted by Husnah (2016) it was obtained that almost 60% of patients with diabetes mellitus in Ulee Kareng Health Center have an inappropriate or poor dietetic pattern. This is largely due to a lack of education from local medical personnel. Several studies related to blood glucose control and diabetes self-management in Banda Aceh showed unsatisfactory results in terms of diabetes mellitus management. That of course requires a review related to the level of self-management of diabetes and

its impact on the level of blood glucose control of diabetes mellitus patients to be an evaluation material in the management of diabetes mellitus, especially in Banda Aceh. Therefore, this study aims to find out the relationship of diabetes self-management with blood glucose control of type 2 diabetes mellitus patients in Ulee Kareng Subdistrict Banda Aceh".

## Materials and Methods

This type of research is observational analytics with cross sectional design, namely by retrieving variable data at a time. This research was conducted in Ulee Kareng Subdistrict, Banda Aceh from October 13, 2020 to November 27, 2020.

The population in this study was all patients diagnosed with type 2 diabetes mellitus in Ulee Kareng Subdistrict, Banda Aceh. While the samples in this study were taken using non-probability sampling techniques with consecutive sampling method, by determining the criteria of inclusion and exclusion. The calculation of the number of samples in this study using slovin formula with a degree of precision of 0.1 and obtained the result was 80 respondents. To prevent the drop out, the number was added 10% so that the minimum number of samples obtained in this study was 88 respondents.

The sample inclusion criteria in this study include 1) Type 2 diabetes mellitus patients who perform outpatient treatment in Ulee Kareng Subdistrict; 2) The patient who signs the informed consent sheet to be willing to be interviewed and examined his blood gluocose levels; 3) Type 2 diabetes mellitus patients who have suffered from diabetes mellitus for a maximum of 10 years. While the sample exclusion criteria in this study include: 1) Diabetes mellitus patients who have a history of chronic complications both microangiopathy and macroangiopathy; 2) Uncooperative respondents.

This research was conducted during the Covid-19 pandemic, so that the data collection was conducted during the Integrated Development Post of Non-Transmitted Diseases (Posbindu PTM) conducted by the public health center.

Diabetes self-management variables are measured by interviewing using the Diabetes Self Management Questionnaire (DSMQ). Interview results are converted into scores of 0-3 from each question and the final results are grouped into three categories, namely bad (0-15), enough (16-31), good (32-48). As for blood glucose control variables due to research conducted during the Covid-19 pandemic, it can only use secondary data from public health center in the form of data on blood glucose levels when from respondents, which is measured when posbindu PTM activities. The data obtained are grouped into two groups, namely controlled ( $< 200$  mg / dL), and uncontrolled ( $\geq 200$  mg / dL).

This study has obtained approval for the implementation of research from the Research Code of Conduct Committee of

the Faculty of Medicine, Syiah Kuala University- Regional General Hospital Dr. Zainoel Abidin (KEPK FK-RSUDZA) with letter number: 205/EA/FK-RSUDZA/2020. Analysis of the data obtained is done univariate and bivariate. Bivariate analysis was conducted using Chi-Square statistical test and Spearman correlation test with 0.05 level of significance.

## Results and Discussion

### Characteristics of Respondents

This research has been conducted in Ulee Kareng Subdistrict, Banda Aceh. Data collection began on October 13 to November 27, 2020, with 88 respondents who have meet the criteria of inclusion and exclusion, with characteristics presented based on the distribution of respondent characteristics as follows:

Table 1. Distribution of respondent characteristics

| Characteristics of respondents             | Frequency (n=88) | Percentage (%) |
|--|------------------|----------------|
| <b>Gender</b>                              |                  |                |
| Male                                       | 11               | 12.5           |
| Female                                     | 77               | 87.5           |
| <b>Age</b>                                 |                  |                |
| 36-45                                      | 6                | 6.8            |
| 46-55                                      | 28               | 31.8           |
| 56-65                                      | 39               | 44.3           |
| >65  | 15               | 17.1           |
| <b>Address</b>                             |                  |                |
| Lamteh                                     | 14               | 15.9           |
| Pango Raya                                 | 7                | 8.0            |
| Pango Deah                                 | 4                | 4.5            |
| Lambhuk                                    | 7                | 8.0            |
| Doy  | 16               | 18.2           |
| Lamglumpang                                | 15               | 17.0           |
| Ceurih                                     | 11               | 12.5           |
| Ilie                                       | 2                | 2.3            |
| Ie Masen Ulee Kareng                       | 12               | 13.6           |
| <b>Formal Education</b>                    |                  |                |
| No education                               | 9                | 10.2           |
| Elementary school                          | 31               | 35.2           |
| Junior high school                         | 16               | 18.2           |
| Senior high school                         | 21               | 23.9           |
| College                                    | 11               | 12.5           |
| <b>Employment</b>                          |                  |                |
| Unemployment                               | 81               | 92             |
| Work                                       | 7                | 8              |
| <b>Long suffering of Diabetes Mellitus</b> |                  |                |
| 0-< 5 years                                | 49               | 55.7           |
| 5-10 years                                 | 39               | 44.3           |

Based on Table 1, the majority of respondents are female, which is 77 people (87.5%). This result is similar to Husnah research (2016) in the same location, namely type 2 diabetes mellitus patients in the Ulee Kareng subdistrict, the majority of whom are female as much as 59.8%. Another study in the area of Public Health Center Jaya Baru, Banda Aceh in 2016 also showed the same results, which was obtained by 67.1% of female respondents (Ramadhan and Hanum, 2017). Based on the data can be stated that the number of women who have diabetes mellitus more than men. This is due to higher levels of sensitivity to insulin work in muscles and the liver in women. Increased and decreased levels of the hormone estrogen can also affect blood glucose levels. When estrogen levels increase, the body becomes resistant to insulin. Moreover. The percentage of fat deposits in women is also greater than that of men, making it easier for women to experience a decrease in insulin sensitivity (Polit and Back, 2012; Brunner, 2014; Ramadan *et al.*, 2018).

Based on the age characteristics of the most respondents from the age group of 56-65 years with 39 people (44.3%) according to the age classification by the Ministry of Health (2009) classified as late elderly. Another study conducted by Enggar at the Indonesian Diabetes Association (PERSADIA) clinic in Surakarta branch (2018) showed similar results, which was obtained by 97.8% of the total patients with type 2 diabetes mellitus in PERSADIA Surakarta branch aged  $\geq 45$  years (Bintanah and Handarsari, 2012). Moreover, research conducted by Ramadhan *et al.* (2018) in the public health center Jaya Baru, Banda Aceh obtained the results of 94.4% of respondents aged 45-60 years. Age is one of the risk factors for type 2 diabetes mellitus. PERKENI in the Manual of Management and Prevention of Diabetes Mellitus Type 2 Adults in Indonesia (2019) stated that the age of  $\geq 45$  years is one of the risk factors for diabetes mellitus that can not be modified. WHO in the book Global Report on Diabetes issued (2016) stated that age is one of the risk factors for type 2 diabetes mellitus.

The distribution of respondents based on residence showed fairly even results from nine villages located in Ulee Kareng Subdistrict, with the most respondents domiciled in Gampong Doy with a total of 16 people (18.2 %). This is because the majority of respondents from Gampong Doy do not work and the location of Posbindu is also close to the center of Gampong Doy, close to markets, schools, and geuchik offices so that it is easily accessible to the public.

Based on Table 1, the majority of respondents were educated last from elementary school with 31 people (35.2%). This is supported by several other studies such as research conducted by Ramadhan *et al.* (2018) showing the results that the majority of respondents are lowly educated (No education or elementary school) with a percentage of 54.1% (Ramadhan *et al.*, 2018). However, in other studies, different results were obtained, namely the majority of people with diabetes mellitus in endocrine polyclinics RSUDZA highly educated high school as much as 31.5% and higher education as much as 41.5% (Zuqni, 2019). This is thought to be because the average low-educated diabetic patient usually prefers to do control and treatment through BPJS services, namely to primary services such as health centers or nearby clinics that are easier to reach. This is in contrast to highly educated people who generally want to get better treatment so choose to seek treatment to advanced health facilities such as family doctors or Regional General Hospitals (RSUD). Other studies have reported that there is no significant link between education levels and type 2 diabetes mellitus in outpatients in polyclinic diseases in BLU RSUP Prof. Dr. R. D Kandou Manado (Mamangkey, 2014; Mongisidi, 2015). Thus, it can be stated that the level of education does not have a significant relationship to the incidence of type 2 diabetes mellitus.

Based on the characteristics of the work in Table 1, the majority of respondents did not work with 81 people (92%) compared to working with a total of 7 people (8%). This is supported by research conducted by Gabby (2014) which showed

the results of the majority of respondents did not work with a percentage of 60.6%. But in the study conducted by Husnah (2016) in the same location, a different result was obtained that the majority of people with type 2 diabetes mellitus in Ulee Kareng's had a job with a percentage of 65.2%. The education status of the majority of respondents (No education or elementary school) may be one of the factors why most respondents do not have a job. These results can also be influenced by the age of the respondent. The majority of respondents ages are classified as late elderly (56-65 years), so usually at that age is no longer productive in work.

When analyzed from the characteristics of the duration of patients with diabetes mellitus, based on Table 1 show the majority of respondents suffered from diabetes mellitus for 0-5 years amounted to 49 people (55.7%) and those with diabetes mellitus >5-10 years amounted to 39 people (44.3%). These results are in line with the results of research conducted by Ramadhan *et al.* (2018) at the Public Health Center Jaya Baru Banda Aceh, which is the majority of respondents with diabetes mellitus in 0-5 years. Research conducted by Fatimah (2016) obtained similar results that about 91.4% of respondents diagnosed with diabetes mellitus for 1-5 years. Long suffering from diabetes mellitus in this study is calculated from patients diagnosed with diabetes mellitus, so it can not be concluded well the actual duration of the patient has diabetes mellitus because the patient could have had diabetes mellitus long before being diagnosed. Calculation of the duration of suffering from diabetes mellitus is usually done to estimate complications. Complications usually arise after 10 years of diabetes mellitus due to physiological changes caused by insulin resistance conditions in diabetes mellitus.

### Levels of Diabetes Self-Management

Interpretation of diabetes self-management level is measured using the standard Diabetes Self Management Questionnaire (DSMQ) which the results are categorized into three categories, namely good, sufficient, and bad. An overview of

the distribution of the results can be seen in the following table.

Table 2 Characteristics of diabetes self-management level

| Level of diabetes self-management | Frequency (n=88) | Percentage (%) |
|-----------------------------------|------------------|----------------|
| Not good                          | 22               | 25.0           |
| Sufficient                        | 39               | 44.3           |
| Good                              | 27               | 30.7           |
| Total                             | 88               | 100.0          |

Based on Table 2, the majority of respondents diabetes self-management rate classified as sufficient category is as much as 39 people (44.3%), while for diabetes self-management bad category amounted to 22 people (25%) and a good category of 27 people (30.7%). Some previous studies have shown similar results, such as endocrine polyclinic research RSUDZA obtained the majority of respondents have self-management diabetes with enough with a percentage of 72.7% (Zuqni, 2019). While in the study conducted by Dhamayanti (2018) obtained more respondents who have a level of self-management diabetes good category of 78 respondents (80.41%). Another study conducted by Inonu (2018) obtained the results of the majority of respondents who have good diabetes self-management with a percentage of 69.2%.

Diabetes self-management can be influenced by various factors, including knowledge, culture, emotional, motivation, and lifestyle factors (Marzuki, 2014). Cultural factors greatly influence the handling of diabetes mellitus in Indonesia, especially Aceh which is an area with a majority Muslim population that has several cultures that develop in the community such as performing fasting every month of Ramadhan and "meugang" activities conducted when welcoming Eid, to inhibit proper diabetes therapy and recommended diabetes diet patterns should be adapted to that culture (Marzuki, 2014; Schulman *et al.*, 2016). Another community culture that has become a tradition in Banda Aceh is the habit of drinking coffee daily in both morning, afternoon, afternoon, and evening, which includes one of them in Ulee Kareng

Subdistrict (Putri *et al.*, 2011). Consuming caffeine-containing coffee regularly can affect a persons glucose tolerance (Rahajeng, 2010). Also, the fact that some types of insulin come from pigs leads to the emergence of the perception that insulin is haraam for use in the treatment of diabetes mellitus in Muslims (Fox, 2010).

Knowledge factors can also affect a persons diabetes management rate. Michael *et al.* (2019) obtained the results that limited knowledge about diabetes self-management can inhibit diabetes mellitus patients to carry out diabetes self-management behavior. The educational status of diabetes mellitus can affect a patients knowledge of diabetes mellitus and include self-management of diabetes, so it can affect diabetes self-management. External factors can also affect a persons level of self-management of diabetes. For example, social and emotional support from closest people such as family and friends to diabetic patients can increase motivation to achieve better self-management (Bai *et al.*, 2009; Akoit, 2015; Elpriska, 2016). Different results were obtained in a study conducted by Fatimah

(2016) to patients with type 2 diabetes mellitus who participated in Posbindu activities, namely the absence of a significant relationship between personal factors (gender, age, education level, long suffering from diabetes mellitus, and family support) with the level of self-management of diabetes patients with diabetes mellitus.

### Level of Blood Glucose Control

Based on Table 3. show that the number of respondents with uncontrolled blood glucose levels was 58 people (65.9%) compared to the number of respondents with controlled blood glucose levels of 30 people (34.1%). Several previous studies have shown similar results found that about 72.7% of people with diabetes mellitus in endocrine polyclinics of Dr. Zainoel Abidin Regional General Hospital (RSUDZA) have uncontrolled blood glucose levels (Zuqni, 2019). Another study conducted by Ramadhan *et al.* (2018) at public health center Jaya Baru, Banda Aceh reported that about 81.2% of people with diabetes mellitus in the puskesmas had HbA1c levels  $\geq 7\%$  indicate low glycemic control.

Table 3 Characteristics of blood glucose levels control

| Levels of diabetes self-management | Blood glucose control |      |            |      | Total |      | <i>p-value</i> | Correlation coefficient |
|------------------------------------|-----------------------|------|------------|------|-------|------|----------------|-------------------------|
|                                    | Uncontrolled          |      | Controlled |      |       |      |                |                         |
|                                    | N                     | %    | N          | %    | N     | %    |                |                         |
| Not good                           | 22                    | 25   | 0          | 0    | 22    | 25   | 0.000          | 0.492                   |
| Sufficient                         | 26                    | 29.5 | 13         | 14.8 | 39    | 44.3 |                |                         |
| Good                               | 10                    | 11.4 | 17         | 19.3 | 27    | 30.7 |                |                         |
| Total                              | 58                    | 65.9 | 30         | 34.1 | 88    | 100  |                |                         |

Some factors that can affect the blood sugar control rate of type 2 diabetes mellitus patients include younger age, non-compliance with treatment and lifestyle, longer duration of diabetes, and complexity of treatment regimen (Pedro *et al.*, 2014). Internal factors patients can also influence such as gender, socioeconomic conditions, body mass index, and complications experienced (Pedro *et al.*, 2014). Research conducted by Mahmood (2016) found that male gender factors, duration of diabetes > 5 years, choice of therapy type, and poor lipid profile associated with poor glycemic control (HbA1c > 6.5%).

In this study, the above factors could not be determined its effect on blood glucose control levels. For example, gender factors and the number of female respondents is much greater than that of male, so it cannot be determined the effect. Also, the employment status factors of housewives and retirees in this study were classified into the no employment group, so the number of respondents who did not work was also very large.

### The Relationship between Diabetes Self-Management and Blood Glucose Control

Based on Table 4, statistical test results show *p-value* of 0.000. The value is

less than 0.05, so  $H_0$  is rejected which means there is a significant relationship between diabetes self-management and blood glucose control of type 2 diabetes mellitus patients in the Ulee Kareng Subdistrict, Banda Aceh.

Table 4 The relationship between diabetes self-management and blood glucose control

| Blood glucose control | Frequency (n=88) | Percentage (%) |
|-----------------------|------------------|----------------|
| Controlled            | 30               | 34.1           |
| Uncontrolled          | 58               | 65.9           |
| Total                 | 88               | 100.0          |

The correlation coefficient value is 0.492, indicating an intermediate level relationship between the two variables. The value is also positive, this means that the type of relationship between the two variables is a positive relationship, that is, the better the respondent's level of diabetes self-management, the higher the value of blood glucose control. Table 4 shows that all respondents with poor diabetes self-management have uncontrolled blood glucose levels and most respondents with good self-management have controlled blood glucose levels.

Some studies supporting the results of this study, namely research conducted by Dhamayanti (2018) reported the relationship of diabetes self-management with blood glucose control of diabetes mellitus type II patients in Prolanis participants in Bandar Lampung ( $p=0.034$ ). Another study in Poliklinik Penyakit Dalam Hospital Karsa Husada Kota Batu concluded that the higher the level of diabetes self-management, the better the control value of blood glucose levels of patients with type 2 diabetes mellitus (Andini, 2017). Also, Hidayah (2019) also reported a link between diabetes self-management behavior and blood glucose control of type 2 diabetes mellitus patients in the public health center Pucang Sewu Surabaya. Research conducted by Zuqni (2019) showed similar results, namely reporting a link between diabetes self-management and glucose levels when patients with type 2 diabetes mellitus in

Endocrine Polyclinics RSUDZA with  $p=0.001$ .

Diabetes self-management is one of the important things that diabetic mellitus should do in achieving good blood glucose levels to avoid various complications due to diabetes mellitus. Aspects considered in diabetes self-management include aspects of diet, physical activity, control of blood glucose levels, and utilization of health services (Schmitt *et al.*, 2013).

The results of this study showed that the lowest aspect obtained in respondents was physical activity, i.e., 48 respondents had a physical activity score that was below average. Regular physical activity such as exercise can affect blood glucose levels, especially in diabetes mellitus patients. A sedentary lifestyle should be avoided, light exercise that is routine such as morning walking, cycling, or gymnastics can help control blood glucose levels of diabetic patients. Aerobic physical activity in diabetics can improve insulin sensitivity so that blood glucose levels remain controlled.

Also, physical activity can lower the risk of cardiovascular disease which is one of the complications due to diabetes mellitus. Therefore, physical activity is one of the important things in controlling blood glucose levels (PERKENI, 2019). Nurayati (2017) reported that there is a significant association between physical activity and blood sugar control in type 2 diabetes mellitus patients. Similar results were also found in research conducted by Paramitha (2014), namely, there is a link between physical activity and blood glucose levels of type 2 diabetes mellitus patients at Karanganyar Hospital. Based on this, it is recommended to people with type 2 diabetes mellitus in Ulee Kareng Subdistrict to be able to perform physical activities suggested by perkeni in the Consensus management of Diabetes Mellitus Type 2, namely moderate physical activity for at least 20 minutes per day with a frequency of 3-4 times per week.

Another aspect that can affect blood glucose control in diabetes mellitus patients is diet regulation, which is obtained the same results between respondents who have a diet setting score below with respondents who are above average, 44 respondents.

Dietary regulation is one of the important elements in diabetes control and is one of the four pillars of diabetes mellitus management. A diet that is appropriate and obediently implemented will help in terms of controlling blood glucose levels of diabetes mellitus patients. The recommended diet has been listed in the Consensus on The Management of Diabetes Mellitus Type 2 by PERKENI (PERKENI, 2019). Susanti (2019) obtained the results that there is a strong relationship between diet and blood glucose levels of patients with type 2 diabetes mellitus with  $p = 0.000$ . The results of the study in the same location with this study obtained the majority of people with type 2 diabetes mellitus in the public health center of Ulee Kareng has an inappropriate dietetic pattern (Husnah, 2016). The biggest contributing factor is the lack of education by local health workers. Therefore, it is recommended to the relevant parties to educate DM patients about appropriate dietary arrangements for the treatment of diabetes mellitus to achieve controlled blood glucose levels in diabetes mellitus patients.

In terms of blood glucose management and utilization of health services, this study showed a fairly good result that 57% of respondents had a score above average. In both of these variables, the association of its influence with blood glucose control showed mixed results. Aspects of glucose management include the regularity of blood glucose level examination and compliance with taking drugs as one of the important pillars in diabetes mellitus control. Anani (2012) showed similar results, but the same study for variable regularity of blood glucose examination did not have a significant relationship with blood glucose levels of diabetes mellitus patients at Arjawinangun Hospital Cirebon Regency.

Aspects of the utilization of health services include regular visits to health services with compliance following health care programs related to diabetes management such as Prolanis. The research conducted by Ismansyah (2020) obtained the results that there is a link between control compliance with blood glucose levels when

diabetes mellitus patients at Rapak Mahang Health Center, Kutai Kartanegara Regency. The different results were obtained in a study conducted by Sugiarto *et al.* (2012) that obtained the results of no significant relationship between control compliance and blood glucose levels of diabetes mellitus patients at Kediri Baptist Hospital. Thus, it can be concluded that aspects of the utilization of health services are quite subjective in achieving successful blood glucose control in diabetes mellitus patients so that some studies still show many different results. External factors such as the quality of health services both facilities and human resources may be able to influence this aspect, so more research is needed on this aspect and its relationship to the control of blood glucose levels of patients with type 2 diabetes mellitus.

## Conclusion

The majority of respondents had adequate diabetes self-management and uncontrolled blood glucose control levels. There is a significant relationship between diabetes self-management and blood glucose control of type 2 diabetes mellitus patients in the Ulee Kareng Subdistrict, Banda Aceh. Suggestion for people with type 2 diabetes mellitus to improve self-management of diabetes to achieve controlled blood glucose levels to avoid various complications due to diabetes mellitus. In addition, suggestion for public health center to improve health promotion and education related to diabetes mellitus management to diabetes mellitus patients to improve diabetes management of diabetes mellitus patients by expanding the targets and educational targets related to diabetes mellitus through programs, one of which is prolanis. Moreover, suggestion for other researchers who want to research blood sugar control to use the HbA1c indicator to make the picture of blood glucose control obtained more accurate.

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