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## The Correlation between The Knowledge Level of Diabetes Management toward The Preprandial Glucose Levels

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ISSN : 2548 4249 (Print)  
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DOI : 10.18196/ijnp.41104**Abstract****Background:** Knowledge about diabetes mellitus affects the lifestyle of patients who suffer from diabetes mellitus. Knowledge is one of the essential factors that determine health management for patients.**Objective:** This study aimed to determine the relationship between the knowledge level of diabetes mellitus (DM) management and preprandial glucose levels.**Method:** This study uses a quantitative cross-sectional method in which the correlation between the knowledge level and the preprandial glucose levels was calculated. Sixty-eight respondents were selected using purposive sampling. The knowledge level of DM management was measured using a questionnaire which consists of 28 questions. The value of the preprandial glucose level was measured using a test tool (easytouch®). The data were analyzed using Pearson product-moment correlation test. The study was conducted from January to February 2019.**Result:** The result shows that respondents have a high level of knowledge of diabetes management, in which the score is 20.37 on average. The respondents have an average preprandial glucose level of 139.72 dl/mg. The Pearson product-moment correlation test shows a significant correlation between the knowledge of DM management and the preprandial glucose level with the coefficient correlation at -0.422, and  $p < 0.001$  ( $p < 0.05$ ).**Conclusion:** There is a correlation between the knowledge level of diabetes management toward preprandial glucose levels.**Keywords:** Diabetes mellitus; Level of knowledge; Management; Preprandial blood glucose**INTRODUCTION**

The epidemiological transition of diabetes mellitus is a phenomenon that is characterized by an increase in morbidity rates and mortality rates. These changing phenomena cause insulin work inhibited, and this inhibition triggers degenerative diseases (Forouhi & Wareham, 2019). Diabetes mellitus is a persistent metabolic disease which relates to the loss of insulin released by the pancreas leading to a rise in glucose levels; it is called hyperglycemia (Forouhi & Wareham, 2019; Koye, Magliano, Nelson, & Pavkov, 2018; Kwon, Hong, Park, & Jung, 2019). Diabetes is a persistent condition that does not lead to a definite cause of

death, but it causes a severe illness if its treatment is not sufficient (Forouhi & Wareham, 2019).

The incidence rate of diabetes tends to grow per year. International Diabetes Federation (IDF) estimated in 2030; diabetes mellitus alone would be at the sixth global ranking for chronic diseases (Forouhi & Wareham, 2019). Nowadays, the number of patients with diabetes has reached 415 million. On the one hand, the World Health Organization (WHO) predicted that this number would rise by 642 million in 2040 (WHO, 2018). On the other hand, diabetes in Indonesia has been predicted to reach the top nine in 2030 for non-

communicable diseases after hypertension (Ministry of Health RI, 2018). Based on the data issued by WHO in 2014, the people with diabetes in Indonesia increased by 21.3 million (WHO, 2018). The data in the Indonesian Health Study, Ministry of Health (Riskesmas) in 2013 indicated diabetes has become the top ten cases in Temanggung District. The Temanggung District Health Officer said that the prevalence of diabetes in 2014 was the second-highest after hypertension by 18.78% of the total 4736 cases.

According to the Indonesia Health policy, the government has implemented a health program through the Indonesian Health Insurance (BPJS). The procedure is to provide facilities for the public in examining their health (Ministry of Health RI, 2013). Indonesian Health Insurance has held promotive and preventive efforts to prevent complications in chronic diseases such as diabetes. Chronic disease management program (*Prolanis*) is a system with a proactive approach by providing health services to the community. The health service involves participants, health providers that all were trying to improve Indonesian people for their healthy (Ulfayani, Laksono, & Likke, 2017).

Indonesian people are less enthusiastic about utilizing health facilities that are programmed by the government; some people tend to neglect their health (Maharani, Herawati, & Anggraeni, 2014). People often underestimate diabetes; apparently, diabetes causes various complications and even leads to death for patients (Haris & Nugraheni, 2017). The increasing incident rate of diabetics in Indonesia is due to the lack of public awareness in conducting health checks (Al Slail, Afridi, Fadl, & Kheir, 2018; Haris & Nugraheni, 2017).

The American Association of Diabetes Educators (AADE) argues that testing and monitoring glucose levels are essential measures to avoid hyperglycemia. However, people continue to conduct a test until they have several symptoms, resulting in delayed diagnosis in the chronic period. The lack of control contributes to a rise in glucose levels in the body and triggers multiple complications (Al Slail, Afridi, Fadl, & Kheir, 2018; Haris & Nugraheni, 2017). A test of glucose levels should be held separately (self-monitoring) to

make it easier to do an early test (Al Slail, Afridi, Fadl, & Kheir, 2018). In particular, experience plays a significant role in the administration of DM in the conduct of effective handling (Al Slail, Afridi, Fadl, & Kheir, 2018; Albuquerque, Correia, & Ferreira, 2015; Haris & Nugraheni, 2017).

The low levels of DM management expertise can influence the ability and sensitivity of patients with diabetes to regulate glucose levels (Al Slail, Afridi, Fadl, & Kheir, 2018; Albuquerque, Correia, & Ferreira, 2015). Exposure to learning, practice, age, and experience are some of the aspects that influence a person's awareness. The knowledge of the diagnosis of diabetes may be given across five pillars to present details on diabetes (Haris & Nugraheni, 2017). A particular standard of experience and understanding is required. The degree of expertise is affected by education, practice, and the environment (Albuquerque, Correia, & Ferreira, 2015; Hermanns et al., 2019; Lawton & Rankin, 2010). In the second half of 2017, patients with diabetes had exceeded 158 population in Parakan Health Services. Patients want a direct test, either by community staff in community services or clinics, and buy an anti-glycemic drug without an adequate prescription, as well as a shortage of knowledge from government authorities. This problem has become one of the factors causing the management of diabetes in the Parakan health center, not running optimally in 2016 and 2017.

## **METHOD**

This research is a quantitative analysis that uses a cross-section method calculating a correlation between the knowledge level of diabetes mellitus (DM) management and the preprandial glucose levels. This research aims to identify the relationship between the two mentioned variables. The data collection was conducted in January-February 2019. Data collected in Parakan Health Center with a set of criteria: a) registered at Parakan Primary Health Services as diabetes patients; b) able to read and write; c) willing to participate in the study. There were 68 respondents chosen in a consecutive sampling test.

The knowledge level of diabetes mellitus (DM) management was measured using a questionnaire

consisting of 28 questions—twenty-eight valid questions of 30 questions developed by the writer and adjusted from the American Diabetes Association. The researchers used two stages of validity testing, namely the content validity index (CVI) and Pearson Product Moment Test (PPMT). The CVI test was conducted by two Universitas Muhammadiyah Yogyakarta (UMY) Nursing lecturers who are experts on diabetes earning 0.6 of Gregory value (high content validity). In the second stage, PPMT, 30 respondents having the same characteristics were chosen and requested from different areas to fulfill the questionnaire. Among the 30 respondents, 28 relevant queries with  $r$  count range= 0.362 - 0.651. The questionnaire is a closed question where the score is 1 (one) if the answer is correct, and the incorrect response is 0 (null). The preprandial glucose level was measured with a standardized glucose monitor (easy-touch®). The questionnaire reliability test uses Cronbach's alpha with a value of  $r = 0.619$  ( $r > 0.6$ ).

Univariate analysis was employed to define the frequency of each variable, including age, sex, profession, sex, background history of having been given education about diabetes, and period of diabetes. Bivariate analysis was conducted to identify the correlation between variables. The correlation test uses the Pearson product-moment method since the data concern a normal distribution. The Faculty Ethics Committee of Universitas Muhammadiyah Yogyakarta issued an ethical approval numbered 003/EP-FKIK-UMY/I/2019.

## RESULTS

Sixty-eight respondents in Parakan Public Health Center, having diabetes who were involved. The respondents chosen met the profiles covering gender, age, education, profession, diabetes education history, as shown in Table 1. Table 1 presents that the highest number of participating respondents is female, up to 41 (60.3%). As many as 26 respondents (38.6%) have primary school education. Most of the respondents were farmers ( $n=24$ , 35.3%), and as much as 55 respondents (80.9%) have ever attending diabetes education. Table 2 shows the distribution of respondent based on diabetes history, age characteristic, knowledge level of DM management and preprandial glucose-

**Table 1.** Respondents characteristic

Characteristic	Frequency (n)	Percentage (%)
<b>Sex</b>		
Male	27	39.7
Female	41	60.3
<b>Education</b>		
Elementary	26	38.2
Junior high school	27	39.7
Senior high school	15	22.1
<b>Occupation</b>		
Civil servant	2	2.9
Retirement	6	8.8
Entrepreneur	18	26.5
Housewife	12	17.6
Farmer	24	35.3
Unemployment	6	8.8
<b>Diabetes education history</b>		
Ever attended	55	80.9
Never attended	13	19.1

levels. The majority of respondents have attended diabetes education ( $n=55$ , 80.9%). The average duration of respondents with diabetes attending counseling is 24 months, with a maximum period of 192 months and a minimum period of a month. The respondents are 48.69 years old on average. Based on a questionnaire which contains 28 questions, the average knowledge level of diabetes management in the respondents is 20.37, and the standard deviation is 3.494.

**Table 2.** Diabetes history

Information	Mean	Std. Dev	Min	Max
Diabetes history	40.88	34.968	1*	192*
Age characteristic	48.69	11.100	35**	72**
Knowledge level of DM management	20.37	3.494	12	26
Preprandial glucose levels	139.72	67.529	67	402

\* month; \*\* years.

Table 3 shows the bivariate analysis uses Pearson correlational test. The result shows that the majority of respondents have the appropriate knowledge level, with 20.37 points on average and 139.72 points on average for preprandial glucose levels. Statistically, there is a significant correlation ( $\alpha=0.001$ )  $p<0.05$  between the knowledge level of DM management and the preprandial glucose levels in respondents with coefficient correlation is (-0.422). The negative path means that if the score on the knowledge level gets high, the value of preprandial glucose levels approaches the standard scale.

**Table 3.** Pearson correlational test result

Variable	Mean	Std. Dev	Min	Max	P-value
Knowledge level of DM management	20.37	3.494	12	26	0.001
Preprandial glucose levels	139.72	67.529	67	402	

**DISCUSSION**

**Respondent characteristic**

Table 1 presents that female respondents dominate the study, up to 41 (60,3%). Sex is one of the risk factors for individuals developing diabetes. The findings of this research are aligned with the Djuned, mentioning that females in the age of menopause (premenopause) are more vulnerable to diabetes as they have an elevated level of LDL relative than males (Djuned & Dieny, 2014). Physically, females have the potential to witness a rise in body mass index that raises the risk of obesity. In line with a study by Fahni & Nugraheni (2017), the findings of the present study show that females with diabetes are doubled to have more risks than males. The increasing age affects hormones in females. The estrogen hormone, which regulates the cycle of endothelial cell regeneration and influences cholesterol levels, has been reduced, and there is evidence showing the less activity the females have, the more possibility they gain weight (Cagnacci et al., 2007) People that are obese require higher calories; consequently, pancreatic cells work more and harder and become unable to generate enough insulin to raise glucose rates and trigger diabetes.

Based on education, as many as 26 respondents (38.6%) have primary school education. According to Notoatmojo (2007), the standard of education is that one cannot be distinguished from the learning process, which consists of the stimulus (awareness) and intervention (behavior). Another definition of learning is an attempt to gain knowledge that is important for life. The degree of elementary school education of an individual is not a significant influence in the level of experience acquired, accompanied by a broad spectrum of information and practice that can allow a person to have a high level of knowledge. This study, in line with Ananda et al. study, mentioned that elementary school levels should not typically have low levels of awareness (Perdana, Ichsan, & Rosyidah, 2013).

People will have a high level of knowledge if they have adequate sources of information (Haris & Nugraheni, 2017). The level of education is directly proportional to the source of information, which is confirmed by the findings of the research, which shows that the level of knowledge increases significantly in the intervention group who was given the knowledge about HbA1c at different levels of education (Hermanns et al., 2019).

Based on occupation, most of the respondents were farmers (n=24, 35.3%). Someone who has an irregular working period is one of the contributing factors for patients with diabetes. Due to the type of occupation, they do not have the time to develop a regular monitoring schedule or visit a specialist to make up for a prescription (Al Slail et al., 2018). Workload also makes people have the potential to forget the therapies that have been given by doctors, thereby reducing adherence to taking medication and exercise for blood glucose control programs (Lawton & Rankin, 2010).

Based on diabetes education history and diabetes history, the majority of respondents have attended diabetes education (n=55, 80.9%). The average duration of respondents with diabetes attending counseling is 24 months, with a maximum period of 192 months and a minimum period of a month. The longer a person has diabetes, the more risks the person develops complications, and the more impaired the underlying. A study argued that having diabetes for more than five years will affect poor glucose control (Fahra, Widayati, & Sutawardana, 2017). Also, anyone who has been suffering from chronic diseases for a long time, in case diabetes, does not regularly take medicine and check-ups. On the other hand, diabetes is a progressive condition that needs lifetime intervention.

Table 2 shows the respondents are 48.69 years old on average. Age is a predictor that can raise a person's risk of developing diabetes. When the age rises, the capacity of the organ function is decreasing, that is, aging may cause declining insulin sensitivity and decrease metabolism activity, for example, glucose metabolism. This study is in line with Widyasari, in which 8.6 percent of people with diabetes are older than 65 years old.

Most of them have type 2 diabetes (Widyasari, 2017). People will experience physiological changes after the age of 40. People over 45 have a growing risk of developing diabetes and glucose intolerance due to factors of degeneration, especially the ability of  $\beta$  cells in the pancreas to produce insulin for metabolizing glucose (Forouhi & Wareham, 2019).

Based on 28 questions in the questionnaire, the average knowledge level of diabetes management in the respondents is 20.37, and the standard deviation is 3.494. The high knowledge level is a crucial point for people with diabetes mellitus to manage their health (Haris & Nugraheni, 2017). The awareness of diabetes management is one of the measures that will help individuals with diabetes maintain diabetes throughout their lifespan, and when they have a high level of diabetes awareness, they can better understand how to manage diabetes (Al Slail, Afridi, Fadl, & Kheir, 2018; Albuquerque, Correia, & Ferreira, 2015; Haris & Nugraheni, 2017; Hermanns et al., 2019). Health-related information may affect the incidence of health problems. Efforts to enhance the wellbeing of the population will be a standard for the quality of their safety. An improvement of the degree of understanding observed by the availability of information that impacts how an individual's conduct enhances the quality of life of a healthy person, how he preserves health, and how he handles illness. Also, a high knowledge level can prevent a variety of factors from causing complications. People with diabetes are possible to improve the quality of life that is productive and to maintain health awareness (Al Slail, Afridi, Fadl, & Kheir, 2018; Albuquerque et al., 2015; Hermanns et al., 2019).

The results of preprandial glucose levels in respondents at the Parakan Public Health Center had an average of 139.72, and the standard deviation was 67.529. The minimum value is 67 mg/dL, while the maximum amount is 402 mg/dL. The average glucose is almost ideal because the respondent has good knowledge and routine daily activities. In contrast, Al Slail et al. (2018) show that poor people with diabetes tend to be unfamiliar and reluctant to control glucose and are not in compliance with the doctor's therapy (Al Slail, Afridi, Fadl, & Kheir, 2018). The average fasting blood glucose value is high because one

respondent (newly suffering from diabetes) has an elevated fasting blood glucose value of 402 mg/dL so that it affects the average preprandial glucose levels. Another study shows that patients need a vigilant program and seriousness to control glucose daily, to take anti-glycemic drugs, and to exercise regularly to get the average value of normal glucose (Albuquerque, Correia, & Ferreira, 2015).

The result showed that the majority of respondents have the appropriate knowledge level, with 20.37 points on average. The awareness about diabetes influences the respondents' life quality. In line with Notoatmodjo, the behavioral change process is equal to the learning process. The strategy to achieve behavioral change in health behavior is to seek sources of information that can provide health knowledge. Good knowledge of diabetes can be a way to manage diabetes well throughout life. As a result, the better and the more people with diabetes understand the disease, the more they know how to change their behavior to perform glucose and health checks regularly. Knowledge is one of the factors that can affect a person's level of compliance with treatment (Notoatmodjo, 2007).

Researchers assume some factors can influence the level of knowledge, including sources of information and experience. The data would have a significant impact on the level of expertise for people with diabetes. The results showed that the majority of diabetics in the Parakan Health Center had attended 55 diabetes education (80.9%) through a program run by the health center, namely "Prolanis". *Prolanis* may be a source of information for diabetics related to diabetes and its treatment (Al Slail, Afridi, Fadl, & Kheir, 2018); people with diabetes will have a high knowledge level of DM management (Ulfayani, Laksono, & Likke, 2017).

The second factor that influences the level of knowledge is the experience that can be gained through the work environment and culture (Tsalissavrina et al., 2018). Alfiani, Yulifah, and Sutriningsih (2017) state that the working environment may allow a person to gain experience and knowledge, both directly and indirectly. Apart from the working environment, environmental culture can also influence the experience of a person's behavior in maintaining his or her health (Alfiani, Yulifah, & Sutriningsih,

2017). *Prolanist* activities may also be an experience for them to receive social support from others so that they can encourage and motivate each other. According to the buffering hypothesis theory, social support can affect the physical and psychological condition of people with type 2 diabetes (Hermanns et al., 2019; Lawton & Rankin, 2010; Tsalissavrina et al., 2018). Good experience can influence people's level of knowledge for the better.

As a result, besides education, other sub-fields influencing knowledge factors include experience and information. Another opinion argues that higher education generally has a high level of knowledge, which has an impact on increasing awareness in efforts to minimize diabetes mellitus (Hermanns et al., 2019; Lawton & Rankin, 2010). However, a high level of knowledge does not determine whether a person will have diabetes or not. The thing that supports a high level of expertise is how to obtain information and experience in the management of health by maintaining a healthy lifestyle and regular check of glucose (Haris & Nugraheni, 2017).

Based on the results of the study, there is a relationship between the knowledge level of DM management and the preprandial glucose levels. This investigation is in line with research conducted by Ananda et al., stating that the higher the level of education, the closer to the average value the preprandial glucose levels (Perdana, Ichsan, & Rosyidah, 2013). People having a proper level of knowledge will seek health services to ensure their glucose levels are within normal limits. Besides, a good experience can contribute to sharing or finding sources of information with health workers (Al Slail et al., 2018). A high level of knowledge in people with diabetes also makes them aware of the importance of control to a doctor or health service. These factors make the preprandial glucose levels of respondents in this study within the normal range. According to Carlos, a high level of knowledge about glucose control also reduces stress levels in people with diabetes, which provides flexibility in finding sources of health care (Albuquerque, Correia, & Ferreira, 2015).

## CONCLUSION

There is a correlation between the knowledge level of diabetes management toward the preprandial glucose levels, with  $\alpha=0.001$  ( $p<0.05$ ). The coefficient correlation value equals -0.422.

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