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Path Analysis of Blood Glucose Determinant on Diabetes Mellitus Patients through Intervening Variables of Medication Adherence

Oktia Woro Kasmini Handayani[1]✉, Pamela Lindasari[1], Sri Ratna Rahayu[1], Ari Yuniastuti[2], Efa Nugroho[3]

[1] Postgraduate Program in Public Health, Semarang State University
[2] Department of Biology, Faculty of Mathematics and Natural Sciences, Semarang State University
[3] Department of Public Health, Faculty of Sport Sciences, Semarang State University

Article Info

Abstract

The prevalence of Diabetes Mellitus (DM) patients in Indonesia in 2013 has increased compared to 2007. The non-adherence of patients in undergoing treatment therapy is one of the drug therapy problems (DTP) that needs special attention. The purpose of the study was to obtain the results of an analysis of direct and indirect relationships related to knowledge, attitudes, family support, and adherence to taking medication for blood glucose levels in patients with DM of type II. Research with correlation analytic research design, with a population of all DM patients of type II with outpatient care in the Sleman region, DIY, were 530 people. The sample was determined by the proportionate stratified random sampling technique of 119 people. The independent variables include knowledge, attitude, family support, while the dependent variable is blood glucose levels in patients with DM of type II and the intervening variable is adherence with taking medication. This study used path analysis techniques. The results of this study draw conclusions, knowledge, attitudes, family support and medication adherence to DM patients with directly influence blood glucose levels. Apart from knowledge, attitudes and family support through adherence to taking drugs indirectly affect blood glucose levels.

INTRODUCTION

The World Health Organization (WHO) predicts that there will be an increase in the number of diabetics from 135 million in 1995 to 300 million in 2025. The highest increase is predicted to occur in the Continent of Asia (Zahra et al., 2016). Diabetes mellitus (DM) is rapidly becoming one of the most common non-infectious diseases globally. Population growth, population aging, and urbanization with associated lifestyle changes are likely to cause a 55% increase worldwide, with diabetes by 2035. China has become the country with the largest number of diabetics in the world (Shugang et al, 2015). Based on WHO data in 2013, the prevalence of DM patients in Indonesia in 2013 (2.1%) experienced an increase compared to 2007 (1.1%). The most common type of DM and the increasing prevalence is type II diabetes mellitus with the most cases being 90% of all cases of DM in the world.

DM is a disease associated with lifestyle, so the success or failure of the management of DM is very dependent on the patient himself in changing his behavior. Rosyida et al. (2015), stated that patient non-adherence to undergoing treatment thera-

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✉ Corespondence Address:
F5 Building 2nd floor, Universitas Negeri Semarang, Sekaran,
Gunungpati Semarang Jawa Tengah 50229
E-mail: oktia_woro@yahoo.co.id

py is one of the Drug Therapy Problems (DTP) that needs special attention. In addition, the research of Meidikayanti & Chatarina (2017) stated that family support is believed to have an influence on the quality of life of people with DM. The patient's knowledge about DM is a tool that can help patients with diabetes management (Perdana, 2013). The results of the study of Amalia et al. (2016), stated that the level of knowledge of DM patients in the less category, so most experienced symptoms of DM but they did not know that it was signs of DM. They also do not know what things can increase sugar levels. The results of the study state that almost half of people with DM of type II have a level of knowledge that is less to bad and less satisfying (Okatiranti & Nur'aeni, 2016; Anju et al., 2015; Kaniz et al., 2017). In addition, research of Herath et al. (2017) found that attitudes toward diabetes were mostly poor (90%) and the level of education did not significantly influence attitudes.

Previous studies conducted in the study area showed that 60% of knowledge about DM disease was lacking, and lack of support from the family, because family members were busy with their work, and 70% were not obedient to taking medication for forgetting or being lazy. The purpose of this study was to obtain the results of an analysis of direct and indirect relationships related to knowledge, attitudes, family support, and adherence to taking medication for blood glucose levels in DM patients of type II.

METHODS

This study used a quantitative approach with correlation analytic research design, using a cross sectional study approach. The population in this study were all DM patients of type II with outpatient care in the Sleman region, DIY, which was an area with a high DM case of 530 people. The sample was determined using the proportionate stratified random sampling technique from 4 work areas of the community health center. The sample size was determined by the Slovin formula (Nursalam, 2013), so that a sample of 119 people was determined. Independent variables include knowledge, attitudes, family support, while the dependent variable is blood sugar levels in patients with DM of type II and the intervening variable is adherence to taking medication. The instrument used for primary data is a questionnaire that contains knowledge, attitudes, family support and adherence of respondents in taking medication, while secondary data was obtained from medical record documents to obtain respondents' blood sugar levels. This study used path analysis techniques.

RESULTS AND DISCUSSION

The results showed that respondents' characteristics as illustrated in Table 1. as many as 56-65 years old (45.4%), senior high school graduation (53.8%), good knowledge (84%), good attitude (82.4 %), Good family support (69.7%), medication compliance (76.5%) and controlled blood sugar (57.1%).

Based on the results of the normality and linearity test, it was concluded that the research data were normally distributed and there was a linear relationship between the independent variables consisting of knowledge, attitudes, family support, and adherence to taking drugs with the dependent variable namely blood sugar levels, so path analysis which is measured by multiple linear regression analysis. Then after testing the model validation with total determinant coefficients and theory trimming, the diagram is as follows:

Interpretation of Figure 1 is as follows:

Direct influence X_1 to Y = P_4, the influence of knowledge variables (X1) the variable of blood glucose levels (Y) are 0,193.

Direct influence X_2 to Y = P_5, the influence of attitude variable (X2) on the variable of blood glucose level (Y) is 0.203.

Direct influence X_3 to Y = P_6, the effect of family support variable (X3) on the variable of blood glucose level (Y) is 0.217.

Direct influence X_4 to Y = P_7, the effect variable of the adherence to taking medication (X4) on the variable of blood glucose level (Y) is 0,223.

Indirect influence X_1 to Y through X_4 = P_1 x P_7, The effect of the knowledge variable (X1) on the variable of blood glucose level (Y) through medication adherence (X4) is 0,290 x 0,223 = 0,065.

Indirect influence X_2 to Y through X_4 = P_2 x P_7, The effect of attitude variable (X2) on the variable of blood glucose level (Y) through medication adherence (X4) is 0.274 x 0,223 = 0,0611.

Indirect influence X_3 to Y through X_4 = P_3 x P_7, Effect of family support variables (X_3) the variable of blood glucose level (Y) through medication compliance (X4) is 0.275 x 0,223 = 0,0613.

Total Influence X_1 to Y through X_4, Y = P_4 +(P_1 x P7) = 0,193 + 0,065 = 0,258

Total Influence X_2 to Y through X_4, Y = P_5 +(P_2 x P7) = 0,203 + 0,061 = 0,264

Total Influence X_3 to Y through X_4, Y = P_6 +(P_3 x P7) = 0,217 + 0,061 = 0,278

Direct Effects and Indirect Effects of Knowledge on Blood Glucose Levels

Based on the results of path analysis, it was shown that knowledge proved to have a direct effect on blood glucose levels with a path coefficient

Table 1. Overview of the Distribution of Respondents Characteristics

Respondents Characteristics	Total	Percentage
Ages		
36 - 45 years old	8	6.7%
46 - 55 years old	28	23.5%
56 - 65 years old	54	45.4%
> 65 years old	29	24.4%
Education		
Graduate of Master Degree	2	1.7%
Graduate of Bachelor Degree	17	14.3%
Graduate of Diploma 3	9	7.6%
Graduate of Senior High Graduate	64	53.8%
Graduate of Junior High School	16	13.4%
Graduate of Elementary School	11	9.2%
Knowledge		
Good	100	84%
Enough	19	16%
Less	0	0.0%
Attitude		
Good	98	82.4%
Enough	17	14.3%
Less	4	3.4%
Family support		
Good	83	69.7%
Enough	34	28.6%
Less	2	1.7%
Adherence to taking drugs		
Obey	91	76.5%
Disobey	28	23.5%
Blood Sugar Levels		
Controlled	68	57.1%
Uncontrolled	51	42.9%

of 0.193 and knowledge was proven to influence blood glucose levels through medication adherence to a path coefficient of 0.065 with a total effect of 0.253. Good knowledge related to health problems will affect the way of view which then influences a person's behavior on the health problems they face, the better level of knowledge of a patient has about DM and its control, the more controlled his blood glucose levels are.

In this study the patient's knowledge is good and directly influences the blood sugar level of 19.3%, besides that knowledge through medication adherence will have a greater influence on blood glucose levels which is equal to 25.8%, where adherence to taking medication from patients at this research is 76.5% is good. Knowledge can directly affect the patient's blood sugar levels, because of other factors,

such as diet, activity or sports factors, and stress factors, so the value of the influence obtained is smaller (19.3%). Knowledge can also influence adherence to taking medication which is a variable intervening, then it will affect blood sugar levels, so the total effect value is greater (25.8%), although there are several other factors that can influence such as family support or other support in the environment.

Knowledge is the basis for health behavior, especially the lack of knowledge about the rules of treatment, the benefits and complications caused by not adhering to the treatment recommendations. This is in line with studies that state that good knowledge related to knowledge about diabetes mellitus, both signs and symptoms and its handling will affect the control of blood glucose levels (Kassahun & Alemayehu, 2017; Qurratuaeni, 2010). The results
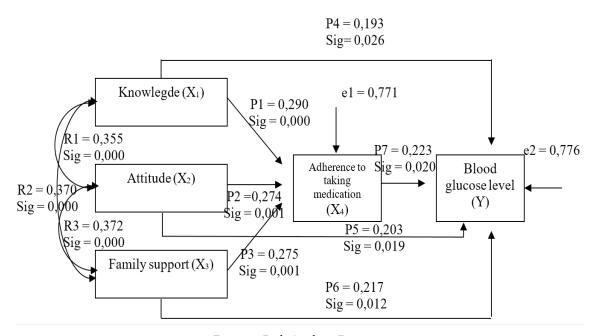
Figure 1. Path Analysis Diagram

of other studies say that ignorance of the treatment of diabetes will cause a lack of control of blood sugar levels and can trigger distress conditions that have an impact on rising blood sugar levels (Fisher et al., 2010).

New behavior, especially in adults, begins in the cognitive domain in the sense that the subject knows first about the stimulus in the form of material objects outside, giving rise to an inner response in the form of attitude. Finally, the stimulus that is the object that has been known and fully realized will cause a further response, namely in the form of an action against a stimulus or object. Knowledge is the first step for someone to determine their attitudes and behavior. So the level of knowledge will greatly influence the acceptance of a program (Notoatmodjo, 2007). Because of the importance of knowledge that must be known by DM patients, various ways are done to be able to transfer health education and patient behavior guidance that can reach large areas, including coastal areas (Quinn et al., 2011). According to Alsous et al. (2019), the need for more educational interventions to overcome negative attitudes and promote healthy lifestyle practices and routine health checks, especially in the subgroup of patients with certain characteristics, such as low education is very important.

Direct Effects and Indirect Effects of Attitudes on Blood Glucose Levels

Based on the results of path analysis, it was shown that attitudes proved to have a direct effect on blood glucose levels with a path coefficient of

0.203, besides that attitudes also influence blood glucose levels through medication compliance with a path coefficient of 0.061, with a total effect of 0.264. Attitude is a reaction or response that is still closed from someone to the stimulus. Attitudes will not necessarily be realized in the form of an action, supporting factors are needed or conditions are possible, such as facilities. A DM patient who has intended to go on a diet as recommended, sometimes gets out of the lane because the situation at home or office is not supportive.

The results of this study are in line with the results of previous studies, such as the results of a study by Al-Maskari et al. (2013), Roux et al. (2018), Ansari et al. (2019), who said that poor levels of knowledge and attitudes related to patient control of DM, which reflected in poor glycemic control and can contribute to morbidity and mortality. Although many research results say knowledge, and attitudes influence patients in controlling their blood sugar, but to improve the ability of DM patients to manage their own blood sugar, they need to think about demographics, education and age and economic conditions (Kheir et al., 2011).

Direct and Indirect Effects of Family Support on Blood Glucose Levels

Based on the path analysis results showed that family support proved to have a direct effect on blood glucose levels with a path coefficient of 0.217, besides that family support was proven to influence blood glucose levels through medication adherence to a path coefficient of 0.061 and a total influence

of 0.278. Family is the social environment that is the closest to DM patients so that it is expected to help, control and shape the behavior of DM patients, including in this case self-management behavior. Family support plays a crucial role in compliance with self-management and indirectly affects the metabolic control. Family support is very important to motivate patients in an effort to create a stress-free environment due to the treatment they undergo. Family social support is as a protector in stress trigger factors and creates a comfortable environment so as to maintain blood sugar control. So that Diabetic Self-management Education (DMSE), which is a process of providing health education to DM patients, regarding the application of self-care strategies independently is to optimize metabolic control, prevent complications and improve the quality of life of patients.

In line with the research of Rosland & Piette (2011), stated that family support can affect the health of patients with chronic diseases, including DM. Communication patterns and good family coping mechanisms can increase the motivation of clients to always maintain their health. Family support is defined as part of social support, is a form of interaction between individuals who provide physical and psychological comfort through the fulfillment of the need for affection and security, which can be empathetic, encouragement, facilitative and participative (Hensarling, 2009). The results of the study concluded that the relationship of family support with medication adherence showed a moderate positive (r=.527), which means that the higher the value of family support, the higher the compliance value of DM patients in undergoing treatment, including the relationship between family social support and patient compliance in implementing diet programs (Nurleli, 2016; Anggina et al., 2010). Research of Awodele & Osuolale (2015), explained that there is a significant relationship between patient age, gender, and adherence to treatment which needs to be taken into consideration especially related to health education and counseling that can produce levels of adherence and improvement of clinical parameters

Good and correct treatment therapy if supported by patient compliance will be very beneficial for the patient themselves, both in terms of health and costs that must be incurred. Adherence of patients in taking drugs is important, especially for patients who have to take drugs for a long time or for life like DM sufferers. Therefore, the efficiency and effectiveness of adherence to drug use are important factors to consider (Rochana, 2009). A new nonpharmacological and pharmacological approach needs to be considered that has a clinically significant and sustained long-term impact on patient adherence. The goal of treatment for DM of type 2 is to prevent or delay complications and maintain quality of life, so it is very necessary to take a patient and environment-centered approach to increase patient involvement in self-care activities (Davies et al., 2018).

The availability of drugs in patients that includes daily, weekly, or even monthly doses must be available in the near future, in order to increase adherence to, resulting in increased glycemic control, reduced complications of diabetes, and health care with minimal costs that can be reduced. Aymen et al. (2017), explained that the longer duration of illness, old age, female sex, and self-perception and patient's belief about the severity of DM were factors associated with adherence to treatment. Increasing interaction and having partner relationships with patients is key to improving patient adherence to drugs.

The direct effect of medication adherence is an influence with the largest total value (22.3%), because for people with DM, drugs are a very influential external factor for controlling blood sugar levels, besides there are other factors that influence, such as diet done. The indirect effect on blood sugar levels with the greatest value is the effect of family support on blood sugar levels through adherence to medication (27.8%). Support from the environment of people with DM, especially the family environment is a factor that needs attention because the characteristics of the largest respondents in the age group are 56-65 years (45.4%), including the age group that begins to depend on the family environment.

CONCLUSIONS

Based on the research conducted, the conclusions are as follows: 1) Knowledge, attitudes, family support and medication adherence in with DM patients directly influence blood glucose levels. 2) Knowledge through adherence to taking drugs indirectly affects the blood glucose level by 25.8%. 3). There is an influence of attitude through adherence to taking medication indirectly to blood glucose levels of 26.4%. 4) Family support through adherence to taking medication has an effect on blood glucose levels of 27.8%.

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