Enfermería Clínica

Factors the incidence of hypoglycemia in diabetes mellitus patients: A pilot study in the emergency room☆

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Abstract
Objective: Hypoglycemia can cause brain disorders and also the death of patients. Diabetes Mellitus patients who came to the emergency room were around 66.7% with hypoglycemia. This situation requires early prevention so as not to increase the number of patients with hypoglycemia. Good prevention requires factors that are sure to cause hypoglycemia. The purpose of this research was to analyse of factors (occupation, education, knowledge, gender, and age) on the incidence of hypoglycemia in diabetes mellitus (DM) patients in the Emergency room (ER).
Methods: The research design used was descriptive analytic with a cross-sectional design. The population in this study were patients with diabetes mellitus who visit the emergency room. A sample of 37 patients was recruited by consecutive sampling technique. Data analysis was performed by Partial Least Squares-Structural Equation Modeling (PLS-SEM) test.
Results: The result shows significant effect on the incidence of hypoglycemia with a value of $T = 3.844$. Characteristic factors of the occurrence of hypoglycemia are gender, occupation, knowledge, education, and age.
Conclusion: It can be concluded that the characteristics of DM subjects have a significant relationship with the incidence of hypoglycemia in patients in the ER.
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Introduction

Diabetes Mellitus (DM) is a disease where glucose levels in the blood are high because the body cannot release or use insulin adequately.[1] This disease can affect all ages and socio economic levels.[2] Indonesia is currently ranked fifth in the world as the country with the highest number of cases of DM up 2 ranks from 2013.[3] The prevalence of diabetes in Indonesia is occupied by the East Java province because diabetes is the top 10 most diseases. The number of DM patients according to Riskesdas has increased from 2007 to 2013 amounting to 330,512 patients.[4] Tambaksari sub-district of Surabaya city has a high case of DM in 2013 and is a health problem because it has a DM prevalence rate exceeding East Java prevalence of 2.1% and higher than the DM prevalence rate in Indonesia which is 1.5%.[5] Patients with diabetes mellitus (DM) are known to cause many complications which are divided into two, namely acute complications and chronic complications.[6] The number of cases and complications places the case of DM in the third highest cause of death in non-communicable diseases in Indonesia in 2016.[7]

DM is a lifelong disease and cannot be cured, but blood glucose levels can be controlled in such a way that it is always the same as the blood glucose level of a normal person. Blood glucose levels that are uncontrolled and not handled properly can lead to various complications.[8] Hypoglycemia is a clinical condition that occurs due to a decrease in blood glucose levels below the normal range, there are adverse effects of hypoglycemia if not immediately handled appropriately, will cause brain nerve function disorders which, if prolonged, will increase morbidity and mortality.[9] The results of a preliminary study conducted at the Emergency Room of Bhakti Dharma Husada Hospital Surabaya found that patients with hypoglycemia from 2012 to 2013 experienced an increase in 80%, and from 15 DM respondents who came to the ER, 10 respondents experienced hypoglycemia.[10]

The prevalence of hypoglycemia is quite high, approximately 90% of patients who get insulin therapy have experienced hypoglycemia. Increased prevalence and the risk of severe hypoglycemia are closely related to the ability of diabetics to manage their disease. The development of hypoglycemia in more severe conditions can be prevented by increasing the ability of DM patients to control blood glucose levels, early detection of hypoglycemia, and appropriate management so that more severe complications can be prevented.[11]

Important steps that need to be implemented so that people with DM can live healthy lives, which are called the four pillars of DM control (Education, Meal Arrangement, Sports/exercise, Medication: tablets or insulin).[12] If the DM patient does not implement the four pillars of DM control, the patient will experience complications. DM can appear acutely or arise suddenly namely hypoglycemia and diabetic coma. Prevention of acute complications in people with DM by controlling blood glucose levels, avoiding foods with high sugar content, taking medication according to the doctor's instructions (the number of doses and the rules taken before or after meals) and by doing regular exercise.[13] This condition requires further research related to the analysis of the incidence of hypoglycemia in DM patients in the emergency room.

Method

The research design used was analytic with a cross-sectional design to analyze factors that influence the incidence of hypoglycemia. The population in this study were all patients who visited the Emergency Room of regional public hospital Surabaya. Samples of 37 patients were recruited by consecutive sampling technique. The technique is done by determining the time of data collection, namely 2 months, October 1 to November 31, 2014. Patients have recruited criteria: (1) Age between 20–60 years, (2) Type 2 DM patients who consume DM drugs from doctors for more than 3 years, (3) awareness of patients with compos mentis after receiving treatment at the ER. Patients who fit the criteria will be observed and given short questions for data collection.

The research instrument used was an observation sheet developed from the theory of type 2 diabetes. The observation sheet consisted of columns in the fields of age, education, occupation, gender, knowledge, and blood sugar levels. Data on age, sex, education, and occupation are seen from the patient's identity card and written on the patient's medical record. Knowledge of patients was assessed with questionnaires about controlling blood glucose levels, including diet, exercise and therapy obtained. Blood sugar levels were assessed by studying the results of the tests listed on the patient's records.

Multivariate Statistical Package Data analysis was carried out by Partial Least Squares-Structural Equation Modeling (PLS-SEM) test version 1 used for main data analysis. The level of statistical significance was set at $p < 0.05$. Research procedure received permission from the research, by a letter dated 20 0/4610/436.7.11/201 5.

Results

The results of data collection representing the characteristics of research subjects are presented on Table 1. The subjects of the study showed that the patient's gender was mostly male. Age of the subjects included in the productive age were more than 60 years. The subject's education is almost entirely at the high school level. Their occupations were mostly in the private sector. Their knowledge of hypoglycemia were mostly at a lower level. Lastly, most of them had experienced hypoglycemia.

The results of the structural model analysis (Fig. 1) found that the coefficient values indicate sex of the patient is the determining factor or measuring the biggest characteristic factor, namely 3.417. In subsequent sequences, characteristic factors are formed by employment indicators (1.322), knowledge (1.025), education (0.731), and age (0.091). Laboratory test have indicators forming or measuring the results of Random Blood Glucose (RBG). There is a significant influence on the characteristics of the RBG level with t value 3.844.

Table 1 Data characteristics Patient (*N* = 37).

No	Characteristics	Patient n (%)
1	*Gender*	
a.	Man	24 (65)
b.	Women	13 (35)
2	*Age*	
a.	25–44 years old	6 (16.2)
b.	45–59 years	2 (5.4)
c.	≥60 years	29 (78.4)
3	*Education*	
a.	High school	23 (62)
b.	Academy	4 (11)
c.	Bachelor	10 (27)
4	*Work*	
a.	Private	18 (49)
b.	Entrepreneur	9 (24)
c.	Soldiers, police, civil servants	10 (27)
5	*Knowledge*	
a.	Less	14 (38)
b.	Is being	12 (32)
c.	Well	11 (30)
6	*Event*	
a.	Hypoglycemia	19 (51)
b.	No hypoglycemia	18 (49)

Discussion

The results showed that there was a significant relationship between the five indicators of characteristics with the incidence of hypoglycemia. This fact is in line with previous research which showed that factors affecting the incidence of hypoglycemia in patients with type 2 diabetes mellitus taking insulin are sex, age, weight, education level, occupation, knowledge, insulin dose and type of insulin.[14] This study only tested these five indicators, but previous studies have added weight and dose of insulins. Although there are different indicators, in this study, it is known that these indicators affect the incidence of hypoglycemia mostly.

The biggest indicator is gender, where this condition is in accordance with the previous research which shows that there is a relationship between gender and the incidence

of hypoglycemia.[15] The characteristics of the results of this study are different from the previous research, which is that more than half of these studies are men, but previous research is the opposite. This situation does not oppose the previous theory which states that women are more likely to experience hypoglycemia. This trend is due to a decrease in the amount of estrogen and progesterone that causes increase fat deposits and changes in blood lipid profiles that can reduce sensitivity to the workings of insulin in the muscles and liver.[16] Although gender plays a role in the incidence of hypoglycemia, during hypoglycemia, neuroendocrine activation and sympathetic nervous system responses do not differ in healthy men and women.[17] This situation explains that the condition of hypoglycemia has an effect on all sexes, especially in someone who are healthy.

The next big indicator in relation to the incidence of hypoglycemia is the respondent's occupation. This condition is consistent with previous studies which also showed that work can affect hypoglycemia.[18] Previous research also discussed related disease conditions to the work undertaken. The results of the study indicate that this condition is equally reciprocal, namely, work affecting hypoglycemia and hypoglycemia affects work. The condition of the disease or hypoglycemia affects the work or vice versa, occurs due to recurrent hypoglycemia conditions or severe hypoglycemia. Mild and rare hypoglycemia is easily detected and managed so that it rarely impacts.[19]

The next influential factor is knowledge. This situation shows that knowledge among Diabetes Mellitus patient about controlling blood glucose levels affects the behavior patterns of patients in responding to their illness. Knowledge or cognitive is a very important domain for the formation of one's actions.[20] A person's behavior is influenced by internal factors, namely: Knowledge, Attitude, Perception, Motivation, Intelligence, Emotion. External factors consist of Family Support, Living Environment, Work Environment, Economic Status, Climate, Human, Culture, Facilities.[11] Family support is one of the most influential factors. Previous research shows that family support is very influential on the behavior of DM patients to adhere to the four pillars of DM control (Education, Meal Settings, Exercise/Exercise, Medication: tablets or insulin).[21] DM patients who adhere to the four pillars of DM control can prevent hypoglycemia. Patients who adhere to the four pillars of DM can control the disease as indicated to have high knowledge. The results of the study explained that the higher level of knowledge of people with diabetes mellitus, the lower is the risk of DM
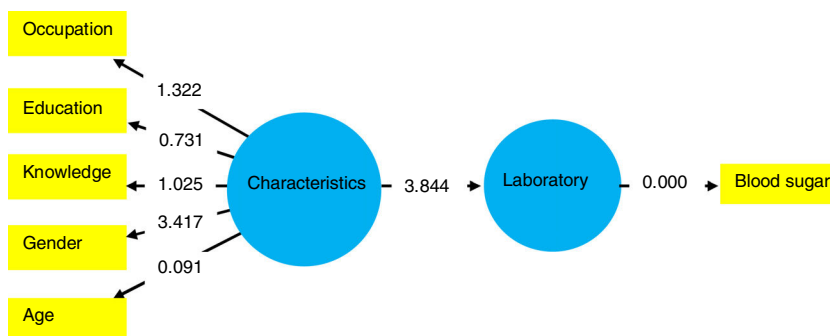

Figure 1 Multivariate statistical test results about factors that influence the incidence of hypoglycemia.

patients experiencing hypoglycemia. It is also found that there is the possibility of people to have diabetes mellitus in spite of good knowledge about controlling glucose levels due causing hypoglycemia, because they only knew and understood but had not implemented well the early treatment of hypoglycemia.

The next influencing factor that is almost similar to knowledge is the education of the respondent. This condition is also in accordance with previous studies which also mention the effect of education on the incidence of hypoglycemia.[14] According to previous research, education status has an effect on the utilization of health services because it affects awareness and knowledge about health.[22] According to the research done taking into educational factor, it was found to have more influence on knowledge whose effects are the same as the factor for knowledge. Education not only affects the utilization of health services but also knowledge in general in preventing, handling, and utilizing services.[13]

The least influencing factor that affect the incidence of hypoglycemia is the age of the respondent. This result is in accordance with previous research which also states that age is very influential in the incidence of hypoglycemia.[14] This study shows that the majority of elderly people indicate a decline in function so it is slow in responding to the incidence of hypoglycemia.[23] Slow responding hypoglycemia patients often enter the emergency unit under conditions of hypoglycemia. This situation indicates that the treatment modalities and the frequency and severity of hypoglycemia vary from individual to individual. So, the best approach is an explanation of the situation to these individuals. This intervention can handle the effect of age on the incidence of hypoglycemia.

Characteristics of gender, occupation, knowledge, education, and age has a significant relationship to the incidence of hypoglycemia in DM patients in the emergency room. Gender is the dominant factor that influence the incidence of hypoglycemia in DM patients in the ER. Men have behaviors that like to eat late because of their busy lives.

Conflict of interests

The authors declare no conflict of interest.

Acknowledgements

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