

THE EFFECTIVENESS OF MONITORING INSULIN SHEET INTEGRATED IN PATIENT TYPE 2 OF DIABETES MELLITUS TO REDUCE THE OCCURRENCE OF HYPOGLYCEMIA

Dikha Ayu Kurnia¹, Debie Dahlia²

Medical Surgical Nursing Department

Faculty Of Nursing, University of Indonesia

Email: d.ayu@ui.ac.id, debie_dahlia@yahoo.com

Abstract

Hypoglycemia is an acute complication that occurs due to insulin therapy in patients with diabetes mellitus type 2. The incidence of hypoglycemia can be reduced by careful monitoring by the health care team, especially nurses. Integrated insulin monitoring sheet is one of the instruments that are being developed by researchers to monitor the condition of patients with type 2 diabetes who received insulin therapy both types of rapid-acting analog insulin and long-acting insulin to avoid hypoglycemia. The instrument has been tested at the seminar of experts provides calories in monitoring, monitoring of the need for education, monitoring insulin therapy, monitoring of blood glucose levels during the time of the daily blood sugar curve and the incidence of hypoglycemia when monitoring protocols, and monitoring difficult to fall asleep. The research method uses non-equivalent approach to the design of post-test only control group design and sampling techniques of non-probability sampling with consecutive sampling approach that 20 patients will be monitored using insulin sheet RS. Fatmawati and 20 patients will be monitored using the integrated insulin sheet. The results of the study to obtain the result that there is a significant relationship between the current monitoring of rapid-acting insulin administration during meals in the afternoon to prevent the incidence of hypoglycemia. Analysis of the data to get the result that there is no significant relationship between the monitoring calorie intake, insulin doses, and changes in sleep patterns with the incidence of hypoglycemia, It can be concluded sheet integrated monitoring insulin is not effective in preventing the occurrence of hypoglycemia.

Keywords: *Type 2 diabetic patients, insulin therapy, instruments, sheet integrated insulin monitoring, the incidence of hypoglycemia*

BACKGROUND

Diabetes Mellitus (DM) Type 2 is a chronic metabolic disease that currently ranks as the sixth leading cause of death in adults (Centers for Disease Control (CDC), 2007) and reached epidemic proportions in the world in line with changes in lifestyle (World Health Organization (WHO), 2008). Diabetes is known to the patient after suffering complications from diabetes disease due to uncontrolled blood sugar instability where frequent hyperglycemic conditions in a long time .. A recent study of the complications of diabetes showed that 1 in 3 people with diabetes have complications of nephropathy, 1 of 5 patients with DM have complications

myocardial infarction, and 1 of 6 patients with diabetes have heart failure complications (Harris et al, 1998; California Healthcare Federation, 2003). Chronic complications due to diabetes can lead to heart disease, hypertension, stroke, neuropathy, retinopathy, and nephropathy (Black, 2004). While in patients with newly diagnosed diabetes in the elderly will experience a higher risk of developing stroke incidence by 62%, congestive heart failure by 65%, and amputation of 300%. (Bethel, 2007).

Hospitals that have had space in endocrine disease treatment that focuses on the care of patients with diabetes mellitus and its complications have had blood

glucose simple. However recording, the recording is not yet integrated with the amount of calories in for a big portion as at breakfast, lunch, dinner, and the number of calories for the portion of any recording integrated is small and caused hypoglycemia in the hospital.

The purpose of this study aims to answer the research question "What is the effectiveness of insulin integrated monitoring sheet in reducing the incidence of hypoglycemia?" The aim of this study include knowing the effectiveness of the integrated insulin monitoring sheet to decrease the incidence of hypoglycemia in patients with diabetes who received insulin therapy. The specific objectives of this study are known patient characteristics (age, sex, education, duration of diabetes mellitus, type of insulin therapy) DM disease, knowing the proportion of patients with diabetes mellitus incidence of hypoglycemia using insulin RS monitoring sheet. Fatmawati and integrated insulin monitoring sheets, and knowing the effectiveness of the monitoring sheets integrated insulin in reducing the incidence of hypoglycemia.

METHODS

This study used a quasi-experimental design with non-equivalent approach to post-test only control group design, this design is aimed to examine the causal relationship by providing intervention (treatment) to the experimental group, then the result (effect) of the intervention and control groups were compared. This study was designed to determine differences in the incidence of hypoglycemia after application monitoring with integrated insulin monitoring sheet. Sampling technique in this study was done by using a non-probability sampling with consecutive sampling approach that is all subject to come and meet the selection criteria entered until the specified number of subjects met (Sastroasmoro & Ishmael, 2010).

Criteria inclusion of samples in this study were patients of DM Type 2 get analog insulin therapy and willing to be a respondent to the old use of insulin therapy for 1 week (7 days). Based on research Achtmeyer (2002) note that the standard deviation of these studies is 2, the average in this study the control group was 7.6 and the average in the intervention group was 9.6. The calculation of this sample using different hypothesis test average of two independent groups with a significance level of 5% and a power of 80%, then the formula using the formula Sastroasmoro sampling and Ishmael (2010), namely: $n_1 = n_2 = 2 Z_{\alpha} + Z_{\beta} s_{x_1 - x_2} / 2 = n_1 = n_2 = 2 \cdot 1.96 + 0,842 \cdot 2 \cdot 9,6 - 7,6 / 2 = n_1 = n_2 = 16$

RESULTS

The results of the data in the intervention group, is the group of patients with Type 2 diabetes who obtain an analog of insulin therapy using insulin sheet integrated monitoring the reliability test. Based on a reliability test, the value of r alpha (.727) is greater than the value of r table (.312) so the question in the intervention group expressed reliably. Respondents Characteristics of patients who were respondents in this study based on age, gender, educational level, and marital status, age, duration of suffering Diabetes Mellitus (DM), and a long hospitalization.

Results of bivariate data to analyze the relationship between the two variables that we want to know relationship includes a relationship between the type of insulin to the incidence of hypoglycemia, the relationship of food intake with the incidence of hypoglycemia, and the relationship with the incidence of hypoglycemia sleep patterns. On the relationship between the type of insulin with hypoglycemia day 1menunjukkan results: $F(39) = 0:01$, $p = 0.9222$, where the results showed no significant results between the different types of insulin with hypoglycemia day 1. While the F-test to

determine the relationship between the type of insulin to the incidence of hypoglycemia day 2 where $F(39) = 1.14$, $p = 0.2933$ also indicates that there is no relationship between the administration of insulin to the incidence of hypoglycemia type 2nd day.

Types of insulin with hypoglycemia day 3: $F(39) = 0.31$, $p = 0.5793$ also shows the value of $p > 0.05$ so there is no significant correlation between the type of insulin and hypoglycemia third day. Test t test was performed to see the relationship between the administration of rapid-acting insulin to the incidence of hypoglycemia in the first day, at a time when breakfast, lunch and evening meals.

The results of the above data indicates that there is a significant relationship between the administration of rapid-acting types of insulin at mealtime afternoon with the incidence of hypoglycemia first day where $p = 0.0043$ so that the value of $p < 0.05$. These results are in contrast to the provision of rapid-acting types of insulin at breakfast time ($p = 0.0059$) and lunch ($p = 0.2765$) where the value of $p > 0.05$ so that there is no relationship between the administration of rapid-acting insulin at breakfast and lunch with the incidence of hypoglycemia. In addition, the type of rapid-acting insulin administration on day 2 at breakfast, lunch and evening meal does not provide meaningful results that when the data is processed, there are no results that emerged between the two variables.

Changes in sleep patterns with the incidence of hypoglycemia did not show up the first day because no experienced hypoglycemia in the intervention group. Meanwhile, on the second day, with kai square test result that no significant results between changes in sleep patterns with the incidence of hypoglycemia well on the second day ($X^2 = 0.566$; $p = 0.45$) and third day ($X^2 = 0.3509$; $p = 0.554$) where $p > 0.05$.

Analysis of multi-variats in this study can not be processed due to the results of the bivariate analysis were not significant between the intake of food, the type of

insulin, and changes in sleep patterns. It can be concluded that the monitoring sheet integrated insulin is not effective in reducing the incidence of hypoglycemia.

DISCUSSION

Type 2 diabetes mellitus is a progressive disease which has the characteristics of a decrease in the function of pancreatic beta that is currently increasing the number of events, especially in patients who are relatively young age. Therefore, insulin therapy is required in its management because it has the advantage that the insulin present in the body naturally. In addition, the management of insulin can be administered in accordance with the pattern of endogenous insulin secretion (PERKENI, 2011).

Respondents in the study were divided into a control group and intervention group. Characteristics of respondents in the control group and the intervention groups include gender, education last, marital status, and medical diagnosis. In the results obtained more female respondents than male respondents both in the control and intervention groups. Education is the most recent high school graduate and control both intervention groups, with the highest perkawinan status is married and DM diagnosed with comorbidities. While the age of the respondents in this study both the control group and the intervention is over 50 years old and suffering from over 3 years old admitted to hospital over 4 days either in the control group and the intervention.

Regarding the characteristics of the respondents in this study, there are risk factors for diabetes mellitus. Risk factors are above 50 years of age where there is more common atherosclerosis due to rising levels of blood lipids, hypertension, smoking, obesity, lack of physical exercise and family history (Black & Hawk, 2009).

Integrated monitoring sheets insulin monitor calories into the patient every day.

Caloric needs of the respondents as much as 1700 kcal diabetic patients in this study. While the intake into the patient's average is 1500 kcal, so it can be seen that the intake of patients is less than the total calorie requirement should be. Carbohydrate intake in patients with diabetes is of considerable concern because it affects insulin therapy is needed, because the calculation that every 15 grams of carbohydrate = 60 cal = 1 unit of insulin (PERKENI, 2011). This is evident in the distribution of insulin in the research data that the participants are getting insulin therapy group intervention most rapid and long-acting types of insulin at the same time as many as 27.5%. In contrast to the control group who had a kind of rapid-acting insulin therapy insulin alone or given a long-acting insulin alone. This affects the incidence of hypoglycemia. In this study, the incidence of hypoglycemia occurred more in the control group were more insulin monotherapy get both rapid-acting insulin or long-acting insulin.

While there are variations in insulin dose between the control and intervention groups. In the administration of rapid-acting insulin, insulin doses were obtained by survey respondents on average were 8 units for 3 days of monitoring. While the average dose of rapid-acting insulin in patients receiving rapid and long-acting insulin by 9 units during the three days of monitoring. While the respondents who received long-acting insulin alone in an average dose of 10 units of insulin. In the protocol of subcutaneous insulin therapy in the type of long acting insulin dose calculation baseline was 10 units of insulin before bed, but the concern for the state of 'just happen hypoglycemia is 5 units (PERKENI, 2011). While in patients with type 2 diabetes are obese, infections, open wounds given 15 units. So in this study, the research respondents who received long-acting insulin alone getting a dose of 10 units in accordance with the protocol. While the dose of rapid-acting insulin in insulin according to the protocol was 0.1 U

/ kg per meal or adjusted after eating at irregular eating patterns. In this study, respondents Keseluruhan get subcutaneous insulin. Insulin is injected by means of subcutaneous insulin reaches peak levels that require a longer time. This was associated with a decrease in blood glucose levels start slower and slower onset of hypoglycemia effects more frequently than subcutaneous insulin therapy in a way.

While fluctuations in the value of the GDS in the control and intervention group on average is above 200 mg / dL. These conditions included in hyperglycemia which GDS score above normal, the GDS as above > 140 mg / dl. Hyperglycemia has the danger of various cells and other organ systems due to its influence on the immune system. In addition, the condition of hyperglycemia may act as mediators of inflammation, resulting in vaskular response, and the response of brain cells. In a state of hyperglycemia, patients can easily occur because of infection phagocyte dysfunction. Acute Hiperglikemmia can cause a variety of adverse effects on the cardiovascular system and facilitate the development of heart failure (PERKENI, 2011).

The incidence of thrombosis is also often associated with conditions of hyperglycemia. Hyperglycemia can lead to a decrease in plasma fibronolitik activity and tissue plasminogen activator activity, increased activity and increased activity of plasminogen inhibitor thrombosis. Acute hyperglycemia is also associated with nerve cell damage that can lead to brain ischemia. Brain damage is thought to occur through increasing tissue acidosis and lactate levels due to increased blood glucose levels. Oxidative stress is a condition commonly found in patients with diabetes and related complications cause hyperglycemia.

In research based on data analysis intervention group obtained significant results of the relationship between the provision of rapid-acting insulin at meals in the afternoon the first day of monitoring on the incidence of hypoglycemia. It is

obtained from the analysis of data from the value obtained by t test $t = 3.0956$ with $p = 0.0043$ where the value of $p < 0.05$. Research conducted by Braithwaite (2005) showed in patients receiving twice premixed insulin or basal insulin in combination with oral agents before entering the hospital will be changed with basal-prandial insulin therapy with dose correction during healing of patients. It is necessary to monitor the occurrence of increased levels of blood and cause glucose incidence of hypoglycemia. In addition, no significant results found in the relationship between caloric intake, insulin doses, and changes in sleep patterns with the incidence of hypoglycemia. So that in this study the monitoring sheet integrated insulin is not effective in preventing the occurrence of hypoglycemia.

Limitations of research found that This study has a number of limitations such as requiring more samples. This study is in accordance with the number of samples required in the control group and the intervention group as many as 20 control group and 20 intervention group. Researchers get the sample was based on calculations using the proportion used by previous studies outside Indonesia. This becomes the input for future research to determine the proportion of the incidence of hypoglycemia in advance in Indonesia to determine the appropriate number of samples in the effectiveness of insulin integrated monitoring sheet.

In addition, the limitations of this study are in the process of data collection and data analysis. Researchers plan monitoring using integrated insulin monitoring sheet for 7 days. During the data collection process of the respondents in the control group and the intervention was monitored for 7 days. However, the effectiveness of the monitoring carried out for 3 days because of the current data processing day 4 to day 7 daily blood glucose data is not being carried out by the treating physician orders for the patient's condition has stabilized. Based on research ethics, that

the researchers monitored the patients and did not like taking blood contact GDS via the tools provided by the researchers, but was not allowed because the appropriate GDS blood sampling in accordance with physician orders a specialist in internal medicine who treat. Thus, the data obtained and can be processed either in the control group and the intervention group performed well during the three days of monitoring using monitoring sheets insulin in hospitals. Fatmawati and integrated insulin sheet developed by the researcher.

CONCLUSION

In this study, the results showed that insulin is not effective integrated monitoring sheet to prevent the occurrence of hypoglycemia. The results showed that there is a significant relationship between the administration of rapid-acting insulin at mealtime afternoon with risk of hypoglycemia. This study also shows that monitoring caloric intake, insulin doses, and changes in sleep patterns do not prevent the occurrence of hypoglycemia. This study has suggestions for future research that needs to know the proportion of the incidence of hypoglycemia in Indonesia. In addition, monitoring using integrated insulin monitoring sheets require substantial time in looking at its effectiveness.

REFERENCES

- Achtmeyer CE, Payne TH, Anawalt BD:
Computer order entry system
decreased use of sliding scale insulin
regimens. *Methods Inf Med* 41: 277-
281, 2002
- American Diabetes Association. Clinical
Practice Recommendations-Executive
summary: Standards of medical care
in diabetes. *Diabetes
Care*.2011;34(Suppl. 1):S9-S10.

- Black & Hawks. (2009). *Medical Surgical Nursing: Clinical Management for Positive Outcome*. 8th ed. USA: Saunders Elsevier.
- Braithwaite S, Buie M, Thompson C. Hospital hypoglycemia: not only treatment, but also prevention. *Endocrine Practice*. 2004;10(Suppl. 2):89-99.
- Braithwaite, S. The Transition from Insulin Infusions to Long-Term Diabetes Therapy: The Argument for Insulin Analogs. *Semin Thorac Cardiavasc Surg*. 18: 366-378. 2006 Elsevier Inc.
- Center for Disease Control (2007). National diabetes fact sheet. Retrieved from: http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2007.pdf
- Perkumpulan Endokrinologi Indonesia.(2011). *Konsensus Pengelolaan Diabetes Mellitus di Indonesia*, PB.PERKENI. Jakarta
- Pollit, D.F., & Beck, C.T. (2004). *Nursing research and methods* (7th ed). Philadelphia : Lippincott Williams & Wilkins
- PP-PL Kemenkes RI (2011). World Diabetes Day 14 November 2011 <http://www.pppl.depkes.go.id/index.php?c=berita&m=fullview&id=374>
- PERKENI. (2011). Petunjuk praktis terapi insulin pada pasien diabetes mellitus. PB Perkeni Jakarta
- Riskesdas.(2007). Riset Kesehatan Dasar.http://www.litbang.depkes.go.id/b1_riskesdas2007.
- Rymaszewski & Breakwell.(2013). A Retrospective Review of Sliding Scale vs. Basal/Bolus Insulin Protocols.*The Journal for Nurse Practitioners – JNP*.Volume 9, Issue 4, April 2013
- Sastroasmoro, S., & Ismael, S. (2010).*Dasar-dasar metodologi penelitian klinis* (Edisi ke-3).Jakarta : Sagung Seto
- World Health Organization, (2008).Diabetes. Retrieved June 1, 2009 from:<http://www.who.int/mediacentre/factsheets/fs312/en/index.html> .