

Complication of Hypoglycemia in Patients with Type 2 Diabetes Mellitus in RSUD
Undata Palu in 2016

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Abstract

Background. Hypoglycemia is an acute complication in people with type 2 diabetes mellitus (type 2 DM) who need serious treatment. Delay in handling the condition of hypoglycemia can lead to more severe complications.

Aim. To find out the number of cases of hypoglycemia complications in type 2 DM patients in the Hospital of Undata Palu in 2016.

Method. The study was conducted by quantitative descriptive observational method.

Analysis. Univariate data analysis to describe the complications of hypoglycemia.

Results. The number of samples of type 2 DM patients with outpatient treatment was 96, 14 experienced complications and 82 patients with type 2 DM without complications. Among 14 type 2 DM patients who experienced complications only 1 had hypoglycemia.

Conclusion. Complications of hypoglycemia are a rare complication in people with DM, but serious attention needs to be taken not to increase and prevent more severe damage to other organs.

Keywords: hypoglycemia, diabetes mellitus, complications.

*Komplikasi Hipoglikemia pada penderita Diabetes Melitus Tipe 2 di RSUD Undata Palu
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Abstrak

Latar Belakang. Hipoglikemia adalah komplikasi akut yang dapat terjadi pada pasien diabetes mellitus tipe 2 (DMT2) terutama dalam terapi insulin. Keterlambatan penanganan kondisi hipoglikemia dapat memicu timbulnya komplikasi yang lebih parah.

Tujuan. Untuk mengetahui jumlah kasus komplikasi hipoglikemia pada penderita DM di RSUD Undata Palu pada Tahun 2016.

Metode. Penelitian dilakukan dengan metode observasional deskriptif kuantitatif. Analisa. Analisa data univariat untuk mendeskripsikan komplikasi hipoglikemia.

Hasil. Jumlah sampel penderita DM yang berobat jalan sebanyak 96, 14 mengalami komplikasi dan 82 penderita DM tanpa komplikasi. Diantara 14 penderita DM yang mengalami komplikasi hanya 1 yang mengalami hipoglikemia.

Kesimpulan. Komplikasi hipoglikemia merupakan komplikasi yang jarang terjadi pada penderita DM, namun tetap perlu diberikan perhatian serius agar tidak meningkat dan mencegah kerusakan organ lain yang lebih parah.

Kata kunci: hipoglikemia, Diabetes mellitus, komplikasi

Introduction

Diabetes mellitus is a condition of hyperglycemia caused by insulin deficiency, insulin resistance or a combination of both. Diabetes due to insulin deficiency is classified as type 1 diabetes mellitus (type 1 DM) and diabetes due to mellitus due to insulin resistance are classified as type 2 diabetes mellitus (type 2 DM). Type 2 diabetes mellitus is a condition in which blood sugar levels exceed normal values. High blood sugar levels are caused by the body not using the normal hormone insulin. This condition is referred to as insulin resistance. The role of the hormone insulin to help sugar (glucose) enter the cells of the body which will then be converted into energy.^(1,2)

Common causes of insulin resistance are being overweight or obese. The excess fat in the body causes a disruption of insulin phosphorylation in the subunits found on the cell surface of the body so that glucose transporters (glucose transporters 4 - GLUT4) cannot carry glucose into the cell. Another factor is heredity. Heredity or if the family has a medical history of diabetes can also affect it. Genetic factors are also factors that cause type 2 diabetes. Uncontrolled diabetes mellitus will lead to complications. Hypoglycemia is an acute complication that can occur in patients with type 2 diabetes mellitus (T2DM), especially in insulin therapy.⁽¹⁾

Hypoglycaemia is one of the acute complications of type 2 diabetes mellitus (T2DM). Hypoglycaemia occurs when blood sugar levels are below the normal level of less than 70 mg / dL. A person with normal glucose level is 72 to 108 mg / dl during fasting, and reaches 140 mg/dL approximately two hours after eating. Usually the symptoms of hypoglycaemia will begin to be felt by someone if their blood is below 70 mg /dL. Glucose is obtained from foods that we digest and absorb. The glucose molecules enter the bloodstream to then be distributed to all cells in the body's tissues. But most of the body's cells cannot absorb the glucose without the roles of the insulin hormone which produced by the pancreas beta cells. Prevention of hypoglycemia is very important to improve the patient's prognosis.⁽³⁾

The risk factor for hypoglycaemia in type 2 diabetes mellitus (T2DM) is a history of hypoglycemia and insulin therapy. The highest risk of hypoglycaemia was

found in people with T2DM who were treated with insulin for more than 10 years. Other risk factors are changes in food intake, excessive activity, and cognitive impairment. Other causes such as alcohol consumption, drug interactions, stress and infection must also be considered. Low levels of glycated hemoglobin (HbA1c) that are low can also trigger hypoglycemic complications in patients with type 2 diabetes.⁽⁴⁾

In general, hypoglycemia in T2DM patients results from an imbalance between hypoglycemic drug intake and the body's physiological needs. Intensive blood glucose level reduction (especially in targets with HbA1c levels below < 6.5%) compared with standard decreases, can increase the risk of severe hypoglycaemia .
(3,4)

Hypoglycaemia is the main barrier to maximizing antihyperglycemic therapy in an effort to achieve better glycemic control. The study in 532, subjects who underwent continuous glucose examination showed that there were half of the population experiencing with or without symptoms of hypoglycemia, and found most in patients on insulin therapy.⁽⁵⁾

Hypoglycemia is an emergency condition that requires rapid recognition and treatment to prevent damage to vital organs, including the brain. Short and long-term complications of hypoglycemia include neurological disorders and cognitive function, decreased quality of life, cardiovascular disorders and death. Severe hypoglycemia is associated with an increased risk of significant cardiovascular and mortality events. Therefore, the following study will examine the occurrence of complications of hypoglycemia in patients with type 2 diabetes in Undata Palu Hospital in 2016. This study can be self-knowledge about hypoglycemia, choosing or modifying therapy to reduce the risk of hypoglycemia is very important for doctors and patients.

Methods

This study was conducted using a descriptive observational method to see the number of patients with type 2 DM who had complications of hypoglycemia. The

number of samples is 96 collected from the patient's medical record data throughout 2016 at the RSUD Undata Palu.

Result

The results of the observation after sorting the patient's medical record, obtained the following results:

Table 1. Distribution of patients with type 2 DM who experience complications of hypoglycemia

Patients with type 2 diabetes	Diabetes Complications				Without Complications	Total N
	HypoGlycaemia		Other Complications			
96	1	7,1%	13	92,9%	82	96

Based on Table 1 above it is shown that the number of patients with type 2 DM with complications of hypoglycemia is only 1 (7.1%) out of a total of 14 patients who experience complications. While compared to all sufferers, only 1.04% of patients experience complications of hypoglycemia.

Discussion

Hypoglycemia is a major barrier in maximizing antihyperglycemic therapy. Hypoglycemic conditions in people with DM can cause long-term and short-term effects including chronic cerebrovascular disease, myocardial infarction, neurocognitive decline, retinal cell death, blindness, etc. (Kalra et al., 2013). In this study it was found that out of 96 patients with type 2 diabetes there were 1.04% who experienced complications of hypoglycemia. This number is relatively small and is experienced by patients who get insulin therapy. This is also supported by the results of research conducted by Edridge et al. 2015, which found as many as 45% or 3 occurrences per year of mild to moderate hypoglycemia and 6% or 1 yearly incidence of severe hypoglycemia in patients with type 2 diabetes. Severe hypoglycemic complications experienced by patients with type 2 DM who were given insulin therapy and moderate hypoglycemia in patients with sulfonylurea therapy. ⁽⁵⁾

The causes of hypoglycemia in diabetics include the use of insulin injections in cases of type 1 diabetes that are overdose, or using too many oral drugs in cases

of type 2 diabetes which can also trigger excessive release of insulin. One of these drugs is sulphonylurea. Using insulin with a normal dose, but the body lacks carbohydrate intake. This problem can occur because people do too much physical activity, do not consume enough foods that contain carbohydrates, forget to eat, or delay eating. Consume too much liquor or alcohol on an empty stomach. While some causes of hypoglycemia in non-diabetic people include production of too much insulin by the pancreas. This can be caused by obesity, consuming too much carbohydrates, pancreatic tumors, or side effects from gastric bypass surgery, consuming too much liquor, fasting, suffering from diseases that attack the thyroid gland, adrenal gland, kidney, or liver, suffering from Addison's disease (abnormalities in the adrenal gland), lack of nutrition. In addition, side effects of drugs, such as propranolol for hypertension, acetyl salicylate for rheumatism, and quinine for malaria. ⁽⁶⁾

Risk factors for hypoglycemia include a history of previous hypoglycemia, use of insulin, kidney disorders, old age, cognitive impairment, failure of autonomic functions (glucose regulation defects) and pregnancy. Independent blood glucose monitoring is also needed to guide therapy and provide warnings for interventions such as converting antihyperglycemic drugs.⁽⁷⁾

Antihyperglycemic drugs that are at high risk of making hypoglycemia in addition to insulin are sulfonylureas (example: glimepirid). Both groups of drugs need must be considered to be replaced with the other groups that do not cause hypoglycemia, or dose adjustments, such as metformin. Diet planning and lifestyle management must also be adapted to diabetes treatment. ^(6,8)

Too much insulin, will automatically cause a decrease in blood glucose levels. Therefore, hypoglycemia is often experienced by people with chronic type 2 diabetes mellitus because they often use insulin or drugs that trigger insulin production to reduce sugar levels in their blood. But not only insulin, there are several other factors, such as poor diet and excessive exercise, it can also cause hypoglycemia.⁽⁹⁾

Population susceptible to hypoglycemia is type 2 DM patients with renal impairment due to impaired insulin removal, decreased insulin degradation in

peripheral tissues, decreased gluconeogenesis in decreasing kidney mass, and increased half-life of other drugs. Furthermore, elderly patients are associated with decreased kidney and cognitive function. Patients with autonomic failure are patients who experience glucose regulation defects. In addition, pregnant women with type 2 diabetes (gestational) also have a high risk of experiencing hypoglycemia due to increased glucose requirements and defects in their glucose metabolism. ⁽¹⁰⁾

Blood glucose levels are too low, the body, including the glucose level in brain, will not function properly. If it occurs, a person suffering from hypoglycemia can experience the following symptoms: fatigue, dizziness, pale, tingling lips, trembling, sweating, feeling hungry, heart palpitations, difficulty concentrating, and irritability. People with hypoglycemia whose condition worsens will experience symptoms such as: drowsiness, visual disturbances, such as confusion, awkward movements, even behaving like a drunk person, seizures, loss of consciousness, worsening symptoms that generally occur when blood levels drop dramatically due to hypoglycemia who did not get the right treatment. ^(4,11)

Diabetics who are suspected of experiencing hypoglycemia, are advised to immediately see a doctor if your condition does not experience positive changes even though it has been dealt with (for example by eating sweet foods or drinks).

Education about the symptoms of hypoglycemia, risk factors, prevention, and first treatment of hypoglycemia to increase patient alertness is done for prevention. Patients trained to deal with hypoglycemia include self-checking blood glucose, providing glucose supplementation, re-checking blood sugar after hypoglycemia episodes, and adjusting drug dosages because the glycemic target of each patient varies according to the clinical situation. Patients are also trained to recognize and respond appropriately the symptoms of neuroglycopenia. Education to patients, families and caregivers about hypoglycemia is a key factor in preventing this complication. ⁽⁸⁾

Education is important to do for T2DM patients, especially those with a history and risk of hypoglycemia. Education provided can include risk factors for hypoglycemia, symptoms, prevention and treatment of hypoglycemia (Yong et al.,

2015). To find out the signs and symptoms of hypoglycemia, there are now many tools available to detect blood glucose levels in pharmacies that can be used by diabetics at home. In addition to controlling the condition of hyperglycemia in diabetics, this tool can also be used to diagnose hypoglycemia. ⁽⁸⁾

When symptoms of hypoglycemia arise, immediately consume foods that contain high levels of sugar, such as fruits juice, sweets drink, or soft drinks. In addition, you can also eat foods whose carbohydrate content can be quickly converted into sugar by the body, such as sandwiches, cereals, or biscuits. After 15 minutes, check your sugar levels again. If it is still below 70 mg / dL, re-consume the sugar-boosting foods. Keep checking every 15 minutes until your sugar level is above 70 mg / dl. After the sugar level returns to normal, keep it stable by eating healthy foods or snacks. If the symptoms are severe or the initial treatment is not effective so that your condition worsens, then immediately see a doctor or hospital. At the hospital, doctors will usually give injections of glucagon or intravenous fluids containing glucose so that your blood levels return to normal. Be sure not to put any food or drink into your mouth when the patient is in an unconscious condition to avoid tightness. ^(5,10)

The principles of preventing hypoglycemia include: management of diabetes involving patients and families or caregivers. This method is done through education to patients and families. Self monitoring blood glucose (SMBG), using antihyperglycemic drugs both insulin and oral drugs in a flexible and precise manner. Determination of individual glycemic targets through controlling the administration of hyperglycemic drugs. Identify existing risk factors for hypoglycemia. Providing professional support and guidance. ^(1,9)

Self-monitoring blood glucose (SMBG) or continuous glucose monitors (CGM) or independent blood glucose checking are important parts of diabetes management, especially for those in high-risk groups. Information from the results of monitoring blood sugar can be used to guide therapy and provide feedback to patients and medical personnel about glycemic control. Other studies show that glucose fluctuations within 24 hours before onset can predict the incidence of severe hypoglycemia. A study using continuous glucose monitoring revealed that

most hypoglycemic episodes occur at night, and potentially do not have conscious hypoglycemic symptoms. In patients with a history of recurrent hypoglycemia, the time for episodes of hypoglycemia to be identified so that the administration of anti-diabetes drugs can be adjusted. ⁽⁹⁾

Long-acting insulin can reduce the risk of nocturnal and symptomatic hypoglycemia by more than 30% in type 2 diabetes mellitus (T2DM). Patients who use oral antidiabetic drugs are also at risk of developing hypoglycemia. Drugs such as metformin, dipeptidyl peptidase-4 inhibitors, and thiazolidindion are more considered to be given than sulfonylureas in minimizing the risk of hypoglycemia. The risk of sulfonylurea hypoglycemia is related to its pharmacokinetic properties and is highest in long-acting sulfonylureas such as glibenclamide. ⁽²⁾

Diet planning and lifestyle management must also be adapted to the treatment of diabetes. The diet chosen by people with DM must be in accordance with the activities carried out. This is important to maintain the availability of sugar needed by the body. Moreover, for diabetics who will exercise, make sure you consume enough carbohydrate foods and adjust the insulin dosage you use according to your doctor's recommendations. For those who often experience symptoms of hypoglycemia at night it is also recommended to eat snacks containing carbohydrates before going to bed, such as milk or biscuits. In addition, store sugary food near the bed in anticipation of symptoms of hypoglycemia that disturbing your sleep⁽²⁾.

Limit consumption of liquor or avoid it altogether. This is because alcohol can affect the body's ability to release glucose. In patients with type 1 diabetes, it is highly recommended not to consume alcohol at all, or consume no more than 30 ml of alcohol per day. Always prepare food or symptom relief wherever you are. One medicine that might be taught by doctors is glucagon injections. Be careful when driving a vehicle. Make sure your condition is prime before driving. Avoid carrying a vehicle if you are recovering or just undergoing treatment in the last 48 hours. Stop the vehicle if you experience a hypoglycemia attack and treat it as early as possible. Lack of glucose intake in brain cells can cause neurocognitive disorders which can be fatal.⁽⁸⁾

Giving diet and lifestyle management must also be adapted of the treatment of diabetes patients. Patients with long-acting sulfonylurea therapy or insulin therapy should not miss or eat late. If the patient is given a postprandial insulin injection, the insulin dose is given along with the meal time. Dietary arrangements given include balanced nutrition, eating small and regular portions, avoiding overeating and bringing glucose sources such as fruit or sweets at any time as the first treatment if hypoglycemia occurs. Patients who often experience nocturnal hypoglycemia are considered to get additional food before going to bed. Planning exercise or practice also needs must be done to get optimal results. (8,12)

Conclusions

Hypoglycemia is an acute complication in patients with type 2 diabetes that can be fatal. Prevention of hypoglycemia is very important to avoid the occurrence of symptoms of hypoglycemia and keep it from getting worse.

References

1. Perkumpulan Endokrinologi Indoensia. 2011. Konsensus Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 di Indonesia.
2. American Diabetes Association. 2011. American Diabetes Association Complete Guide to Diabetes. 5thed. Alexandria, VA: American Diabetes Association
3. Zhao, Y., P.H.D., Campbell, C. R., P.H.D., Fonseca, V., M.D., & Shi, L., P.H.D. (2012). Impact of hypoglycemia associated with antihyperglycemic medications on vascular risks in veterans with type 2 diabetes. *Diabetes Care*, 35(5), 1126-32. Retrieved from <http://search.proquest.com/docview/1013612903?accountid=25704>
4. Chul Ha W., Jin Oh S., Lee J.M., Chang S.A., Sohn T.S., and Son H.S. 2012. Severe Hypoglycemia is a Serious Complication and Becoming an Economic Burden in Diabetes. *Diabetes Metab J*. 36 (4): 280-284.
5. Edridge C.L., Dunkley A., Bodicoat D.H., Rose T.C., Gray L.J., Davies M., Khunti K. 2015. Prevalence and Incidence of Hypoglycaemia in 532,542 People With Type Diabetes on Oral Therapies and Insulin: A systematic Review and Meta-Analysis of Population Based. *Plos One*. 10 (6): 1-20.
6. Leese GP, Wang J, Broomhall J, Kelly P, Marsden A, Morrison W, Frier BM, Morris AD, DARTS/MEMO Collaboration. Frequency of severe hypoglycemia requiring emergency treatment in type 1 and type 2 diabetes: a population-based study of health service resource use. *Diabetes Care*. 2003 Apr; 26(4):1176-80.

7. Quilliam, B. J., Simeone, J. C., & Ozbay, A. B. (2011). Risk factors for hypoglycemia- related hospitalization in patients with type 2 diabetes: A nested case-control study. *Clinical Therapeutics*, 33(11), 1781-91. doi:<http://dx.doi.org/10.1016/j.clinthera.2011.09.020>
8. Yong, Y-M, Shin, K-M, Lee, K-M, Cho, J-Y, Ko, S-H, Yoon, M-H, Ahn, Y-B. (2015). Intensive individualized reinforcement education is important for the prevention of hypoglycemia in patients with type 2 diabetes. *Diabetes Metab J*, 39, 154-163. <http://dx.doi.org/10.4093/dmj.2015.39.2.154>
9. Seaquist, E. R., M.D., Anderson, J., M.D., Childs, Belinda, ARNP, MN,B.C.- A.D.M., C.D.E., Cryer, P., M.D., Dagogo-Jack, S., Fish, L., M.D., . . . Vigersky, R., M.D. (2013). Hypoglycemia and diabetes: A report of a workgroup of the american diabetes association and the endocrine society. *Diabetes Care*, 36(5), 1384-95. Retrieved from <http://search.proquest.com/docview/1353342486?accountid=25704>
10. Permana H. 2009. Komplikasi Kronik dan Pengertian Diabetes. Universitas Padjajaran.
11. Kalra S., Mukherjee J.J., Venkataraman S., Bantwal G., Shaikh S., et al., 2013. Hypoglycemia: the Neglected Complication. *Indian J Endocrinol Metab*. 17 (5): 819-834.
12. Mayo Clinic. 2012. Prediabetes: Definition. Januari 26th. <http://www.mayoclinic.com/health/prediabetes/Ds00624>