RISK FACTORS OF TYPE 2 DIABETES MELLITUS IN THE ELDERLY

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Abstract
The high incidence of Type 2 diabetes mellitus (DM) in the elderly in Padang is due to several factors, one of which is an unhealthy lifestyle, namely consumption of foods high in fat, so preventive and promotive efforts are needed in the form of early detection of DM risk factors as well as providing education and health education. to the public about matters relating to DM. The increase in the incidence of DM is related to the increase in the elderly population, economic development, decreased consumption of healthy foods, physical activity and obesity, especially central obesity. Elderly is an advanced stage of the life process that shows signs of decreased physical ability to adapt to environmental pressures which will be measured using the Global Physical Activity Questionnaire (GPAQ).
Keywords: Type 2 DM, Risk Factors, Elderly

Abstrak
Tingginya angka kejadian DM tipe 2 pada lansia di padang dikarenakan oleh beberapa faktor salah satunya dari pola hidup yang tidak sehat, yaitu konsumsi makanan yang tinggi lemak, maka diperlukan upaya preventif dan promotif berupa deteksi dini faktor-faktor risiko DM serta pemberian edukasi dan pendidikan kesehatan kepada masyarakat tentang hal yang berkaitan dengan DM. Peningkatan kejadian DM berhubungan dengan peningkatan populasi lansia, perkembangan ekonomi, penurunan konsumsi makanan sehat, aktivitas fisik dan obesitas, terutama obesitas sentral. Lansia merupakan suatu tahap lanjut dari rentang proses kehidupan yang menunjukkan tanda-tanda penurunan kemampuan fisik untuk beradaptasi dengan tekanan lingkungan yang akan diukur dengan menggunakan kuesioner instrumen *Global Physical Activity Questionnaire* (GPAQ).
Kata Kunci: DM tipe 2, Faktor Risiko, Lansia

INTRODUCTION

Type 2 diabetes mellitus (DM) is a condition in which blood glucose levels in the body are not controlled because pancreatic β cells are less sensitive to the production of the hormone insulin. Insulin has the function of regulating the balance of blood glucose levels in the body, but if glucose/carbohydrate intake is too high, insulin cannot balance blood glucose levels and hyperglycemia occurs. [1] The global prevalence of Type 2 DM continues to increase until it triples in 2030. This increase has actually been predicted by WHO that in 2030 it will reach 21.3 million and from IDF in 2045 it will reach 16.7 million. Conditions in Indonesia are not much different, the high volume of incidents is accompanied by high costs. Early diagnosis and comprehensive management of Type 2 DM sufferers can reduce morbidity and mortality rates due to the presence of comorbid diseases or their complications.

Efforts to treat DM sufferers still face obstacles in terms of patients, services and health financing in Indonesia.[2]

The increase in the incidence of diabetes is related to the increase in the elderly population, economic development, decreased consumption of healthy foods, physical activity and obesity, especially central obesity. Individuals with central obesity have a risk of developing DM up to 1.8 times higher than normal people. The incidence of central obesity increases with age.[3]

Elderly is an advanced stage of the life process that shows signs of decreased physical ability to adapt to environmental pressures which will be measured using the Global Physical Activity Questionnaire (GPAQ) instrument questionnaire. GPAQ is a questionnaire issued by WHO to determine the level of physical activity of individuals, especially in developing countries. Consisting of 16 questions which cover 3 important things, namely physical activity while working, travel activities from place to place, and activities that are recreational or free time.

Risk Factors Type 2 Diabetes Mellitus

Risk factors according to the ADA consist of those that cannot be changed and those that can be changed, there are also other risk factors related to Type 2 DM.[4] **Risk factors that cannot be changed:**

1. Family history of Diabetes Mellitus

A person suffering from DM is thought to have the diabetes gene. It is suspected that diabetes is a recessive gene. Only people who are homozygous for this recessive gene suffer from DM.[4]

2. Age

Based on research, the most common age for DM is ≥ 45 years old. Someone aged ≥ 45 years has an increased risk of developing DM and glucose intolerance due to degenerative factors, namely decreased body function to metabolize glucose. However, it turns out that this condition is not only caused by age, but also by the length of time the sufferer persists in this condition. 12

3. History of giving birth to a baby

With a BW > 4000 grams or a history of Gestational Diabetes Mellitus and a history of birth with a low BW < 2500 grams.[4]

4. Gender

Male and female genders are at the same risk of developing DM. Gender influences the increase or decrease in blood glucose levels in type 2 DM sufferers because both men and women have the same level of risk of suffering from type 2 DM, but the difference lies in other factors that influence blood glucose levels.[5]

Women can experience type 2 DM because physically women have a greater chance of increasing their BMI with monthly cycle syndrome (premenstrual syndrome). Women who have entered the monoupous period are at risk of suffering from DM because the distribution of body fat becomes accumulated due to hormonal processes.[6,7]

Risk factors that can be changed:

1. Obesity (overweight)

Based on BMI (Body Mass Index) > 25kg/ or abdominal circumference ≥ 80 cm (women), ≥ 90 cm (men). Obesity is the main risk factor for diabetes mellitus.

The relationship between type 2 diabetes mellitus is very complex. Obesity can make cells insensitive to insulin (insulin resistant). Insulin in the body plays a role in increasing glucose uptake in many cells and in this way also regulates carbohydrate metabolism, so that if insulin resistance occurs by cells, then blood sugar levels can also be disturbed.[1,3]

2. Hypertension

Increased blood sugar levels can occur due to insulin resistance, where there is damage to the insulin receptor so that insulin cannot be used to break down glucose, which in turn can result in increased sodium retention in the kidneys and increased activity of the sympathetic nervous system. Sodium retention and increased activity of the sympathetic nervous system are two things that influence increased blood pressure. Increased blood sugar levels or what is more commonly known as hyperglycemia can also increase angiotensin II and cause hypertension. Damage to the arterial endothelial lining due to high levels of glucose in the blood, glucose metabolites, or high levels of fatty acids in the blood causes the permeability of the endothelial cells to increase so that molecules containing fat enter the arteries. Damage to endothelial cells will trigger an immune and inflammatory reaction resulting in the deposition of platelets, macrophages and tissue fibrosis as well as proliferation of vascular smooth muscle cells which is the beginning of atherosclerotic lesions in the blood vessels, thus triggering an increase in blood pressure.[4,7]

3. Dyslipidemia

Lipid metabolism disorders in the form of increased levels of total cholesterol, low density lipoprotein (LDL), triglycerides (> 250 mg/dL), and decreased high density lipoprotein (HDL), men (< 40 mg/dL) women (< 50 mg/dL). dL) is associated with an increase in plasma insulin which is often found in Type 2 DM patients. [4] Dyslipidemia in DM sufferers is characterized by increased fasting and postprandial triglyceride levels, low HDL cholesterol, increased LDL cholesterol. Altered lipid profiles represent the main link between DM and increased cardiovascular risk in DM patients due to altered insulin-sensitive pathways, increased free fatty acid concentrations and decreased catabolism of triglyceride-rich lipoproteins from the intestine and liver. Lifestyle modifications and glucose control can improve the lipid profile so that it can reduce cardiovascular risk, because if left untreated, other quite fatal complications can arise, such as coronary heart disease, kidney disease, blindness, atherosclerosis, and even part of the body can be amputated.[4,5]

4. Alcohol and Cigarettes

Changes in lifestyle are associated with an increase in the frequency of type 2 DM. Nicotine in cigarette smoke has an effect on insulin, including causing a decrease in insulin release due to the activity of catecholamine hormones, disruption of pancreatic β cells and the development of insulin resistance. 11 Smoking habits can be a risk factor. Type 2 DM disease, because cigarette smoke can increase glucose levels. The effect of smoking (nicotine) stimulates the adrenal glands and can increase glucose levels.[5,8]

5. **Lack of physical activity**

Lack of physical activity can increase the risk of Type 2 DM. High-income groups generally rarely engage in physical activity. The best strategy to prevent type 2 DM is to control your weight and carry out physical activity for at least 30 minutes per day. Can be measured using the GPAQ questionnaire. GPAQ consists of 16 questions designed to estimate a person's level of physical activity in 3 activity domains, namely (work, travel and recreation) as well as time spent on sedentary behavior.[1,5] Physical activity is generally defined as body movement produced by skeletal muscles and resulting in energy expenditure. Physical activity is a form of behavior, while energy expenditure is the result of that behavior. When doing physical activity, muscles use the glucose they store so that the stored glucose will decrease.[2]

Physical activity is one of the important things to do in managing type 2 DM. PERKENI explains that daily activities are not included in physical exercise. Apart from maintaining fitness, this physical exercise can also reduce weight and improve insulin sensitivity, which will improve blood glucose control. PERKENI recommends that physical exercise be carried out in the form of aerobic physical exercise with moderate intensity (50-70% of maximum heart rate) and must be adjusted to the age and physical fitness status of each individual.[3]

A person's physical activity contributes 30-50% to reducing the development of type 2 DM. Physical activity can increase blood glucose tolerance and reduce risk factors for type 2 DM. 64 Physical activity carried out by a person can reduce the risk of developing DM, this is due to the effects of body weight and insulin sensitivity. Someone who has low levels of fat in their body tends to have a lower risk of suffering from DM, and vice versa, lack of physical activity makes the body's secretion system run slowly and results in excess body weight which can later cause Type 2 DM.[2,5]

Other factors associated with the risk of Type 2 DM[4]

1. People with polycystic ovary syndrome (PCOS)

2. People with metabolic syndrome have a history of impaired glucose tolerance (IGT).

3. Impaired fasting blood glucose (GDPT)

4. Cardiovascular diseases such as stroke, Coronary Heart Disease (CHD), or Peripheral Arterial Diseases (PAD), alcohol consumption, stress factors, smoking habits, gender, coffee and caffeine consumption.

Pathophysiology of Type 2 DM

Type 2 diabetes mellitus occurs due to damage to insulin molecules or disruption of insulin receptors which results in failure of insulin function to convert glucose into energy. Type 2 DM sufferers have a normal amount of insulin in the body and it can increase, because the number of insulin receptors on the cell surface decreases causing less glucose to enter the cells. This will result in a shortage of glucose and high glucose levels in the blood vessels.[1,5]

Type 2 diabetes mellitus is not caused by a lack of insulin secretion, but is caused by insulin target cells failing or being unable to respond to insulin normally. This condition is commonly referred to as "insulin resistance". Insulin resistance

often occurs as a result of obesity, lack of physical activity and aging. Type 2 DM sufferers can also experience excessive hepatic glucose production but there is no autoimmune destruction of Langerhans β cells like type 2 DM. Deficiency of insulin function in type 2 DM sufferers is only relative and not absolute.[2]

The development of type 2 DM is indicated by impaired first phase insulin secretion in β cells, namely insulin secretion fails to compensate and results in insulin resistance. If it is not handled properly, in the future there will be damage to the pancreatic β cells. Damage to pancreatic β cells will occur progressively, often causing insulin deficiency, so that ultimately the patient requires exogenous insulin. In people with type 2 DM, these two factors are generally found, namely insulin resistance and insulin deficiency. [4,6]

Insulin deficiency reduces glucose uptake by muscles, soft tissue, splanchnic tissue and there will be an increase in glycogenolysis and gluconeogenesis. Blood glucose levels will increase and result in an increase in extra cellular fluid osmolality. An increase in osmolality that exceeds the renal threshold will cause glucose to be excreted in the urine. The existing glucose will attract water and other electrolytes so that patients complain of frequent urination or polyuria. In this way, the body will always be thirsty and this will result in drinking a lot (polydipsia). [4,7,8] Polyphagia is caused by glucose in the blood not being able to be used in peripheral tissues so that the body will lack glucose in the process of starvation which causes the patient to eat a lot. Apart from that, insulin deficiency in type 1 DM patients also results in reduced amino acid uptake and protein synthesis, resulting in less muscle nitrogen requirements. Protein catabolism also increases, so that clinically muscle mass in peripheral tissues decreases and results in weight loss. [9]

Unused glucose in cells or peripheral tissues causes the body to become weak and less active. In Diabetic Ketoacidosis (DKA) there are symptoms of shortness of breath and decreased consciousness. The condition of DKA always manifests with decreased consciousness and metabolic acidosis. Patients generally present with DKA due to late diagnosis.[4,10]

Elderly with Type 2 Diabetes Mellitus

Blood glucose levels increase mildly progressively after ≥ 45 years of age, especially in people who lack physical activity and are obese. It is known that glucose metabolism efficiency will develop from the third or fourth decade of life and will decline rapidly after age 60 years. Age can cause decline in all body systems, including the endocrine system. Increasing age causes a condition of insulin resistance which results in unstable blood sugar levels so that elderly people can cause DM due to increasing age which degeneratively causes a decrease in body function.[11,12]

Decreased capacity to respond to stimuli makes it difficult for elderly people to maintain stable physical and chemical status in the body or maintain body homeostasis. Disruption of this homeostasis leads to dysfunction of various organ systems and increases susceptibility to various diseases. One of the disturbed homeostasis is the system for regulating blood glucose levels.[6,13] Disorders of blood glucose regulation in the elderly include three things, namely insulin resistance, loss of first phase insulin release, and increased postprandial blood glucose levels. Among

these three disorders, the most frequently found is insulin resistance. Insulin resistance can be caused by changes in the body fat composition of elderly people in the form of increasing fat composition from 14% to 30% (less muscle mass while more fat tissue), decreased physical activity resulting in a decrease in insulin receptors, changes in diet such as eating more carbohydrates. , and neurohormonal changes.[4,17]

CONCLUSION

A disturbed blood glucose regulation system can result in an increase in blood glucose more than normal. Blood glucose will increase with age. So the aging process will result in more and more elderly people being at risk of developing DM. Type 2 Diabetes Mellitus in the elderly is generally asymptomatic, although it presents with non-specific symptoms such as weakness, lethargy, changes in behavior, decreased cognitive status or functional ability. This is what causes the diagnosis of type 2 DM in the elderly to be discovered rather late.

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