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REVIEW PAPER

## Diabetic Mellitus it's Prevalence and Patient Education: A Review

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### ABSTRACT

Diabetic mellitus is a group of metabolic diseases characterized by increased levels of glucose in the blood (hyperglycaemia) resulting from defects in insulin secretion. Insulin action or both (American Diabetes Association)( ADA 2009a). Normally a certain amount of glucose circulates in the blood. The major sources of this glucose are absorption of ingested food in the gastrointestinal tract and formation of glucose by the liver from food substances.

**Keywords:** - *Diabetic mellitus, hyperglycemia, glucose, Blood, Insulin.*

### INTRODUCTION

Epidemiology\_ Diabetic is becoming more common in the United States from 1980 through 2002, the number of Americans with diabetes more than doubled and increased in all age currently, it is estimated that more than 23 million people in the United States have diabetes, although almost one third of these cases are undiagnosed.[2-7] The number of people newly diagnosed with diabetes increases by about 1 million people per year (Center s for Disease Control and Prevention (CDC)2008). By 2030, the number of case is expected to exceed 30 million. In 2000, the worldwide estimate of the prevalence of diabetes was 171 million people, and by 2030, this is expected to increase to more than 360 million (World Health Organisation, 2008). Diabetic is especially prevalent in the elderly, as many as 50% of people older than 65 years of age have some degree of glucose intolerance. People 65 years and older account for almost 40% of people with diabetes[13].

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### RISK FACTORS FOR DIABETES MELLITUS

- 1) Family history of diabetes (ie, parents or siblings with diabetes)
- 2) obesity (ie, 20% over desired body weight or BMI)
- 3) Race /ethnicity (eg, African American, Hispanic Americans, Native Americas)

- 4) Age above 45 years
- 5) Previously identified impaired fasting glucose or impaired glucose tolerance
- 6) Hypertension
- 7) HDL cholesterol levels
- 8) History of gestational diabetes or delivery of babies over 9 lb

### **PATHOPHYSIOLOGY**

Insulin is secreted by beta cells which are one of four types of cells in the islets of Langerhans in the pancreas. Insulin is an anabolic or storage hormone. When a person eats a meal, insulin secretion increases and moves glucose from the blood into muscle, liver, and fat cells. In those cells, insulin [12].

- 1) Transports and metabolizes glucose for energy
- 2) stimulates storage of glucose in the liver and muscle
- 3) signals the liver to stop the release of glucose
- 4) Enhance storage of dietary fat in adipose tissue
- 4) Accelerates transport of amino acid into cell

Insulin also inhibits the breakdown of stored glucose, protein, and fat. During fasting periods (between meals and overnight) the pancreas continuously releases a small amount of insulin (basal insulin). Another pancreatic hormone called glucagon (secreted by alpha cells of the islets of Langerhans) is released when blood glucose levels decrease and stimulates the liver to release stored glucose. The insulin and the glucagon together maintain a constant level of glucose in the blood by stimulating the release of glucose from the liver [9,12].

Initially, the liver produces glucose through the breakdown of glycogen (glycogenolysis). After 8 to 12 hours without food, the liver forms glucose from the breakdown of various carbohydrate substances including amino acid (gluconeogenesis).

### **Type 1 Diabetes**

Type 1 diabetes affects approximately 5% to 10% of people with the disease; it is characterized by an acute onset usually before 30 years of age (CDC, 2008). Type 1 diabetes is characterized by destruction of the pancreatic beta cells; combined genetic, immunologic, and possibly environmental factors are thought to contribute to beta cell destruction. Although the events that lead to beta cell destruction are not fully understood, it is generally accepted that genetic susceptibility is a common underlying factor in the development of type 1 diabetes. People do not inherit type 1 diabetes itself but instead inherit genes in the bloodstream that contribute to postprandial (after meals) hyperglycaemia. If the concentration of glucose in the blood exceeds the renal threshold for glucose, usually 180 to 200 mg/dl [17].

The kidney may not reabsorb all the filtered glucose. The glucose then appears in the urine (glycosuria) when an excess amount of glucose is excreted in the urine; it is accompanied by excessive loss of fluids.

and electrolyte [11]. This is called osmotic diuresis. Because insulin normally inhibits glycogenolysis (breakdown of stored glucose) and gluconeogenesis (production of new glucose from amino acid and other substrate) these processes occur in an unrestrained fashion in people with insulin deficiency and contribute further to hyperglycaemia.

## **SYMPTOMS**

### **1. Going to the bathroom more than usual**

Frequent urination can be an early sign of diabetes. The average person passes urine between four and seven times a day, but people with diabetes often go much more often because the body is trying to get rid of extra glucose by making more urine [19].

### **2. Feeling very thirsty all the time**

People with diabetes often feel very thirsty and have a very dry mouth. This feeling can continue even if they drink plenty of fluids.

### **3. Having itchy skin**

That same dehydration that causes thirst and dry mouth can also cause dry and itchy skin.

### **4. Having an increased appetite**

The body converts food into glucose during the digestive process; cells then use glucose as a source of energy. But when the body doesn't produce insulin (as in type 1 diabetes) or doesn't respond to insulin (as in type 2 diabetes), this glucose can't be drawn from the blood into the cells. Therefore, people with untreated diabetes often feel hungry even though they are eating enough [23].

### **5. Feeling tired or drowsy**

Feeling extremely tired can simply be the result of working too hard or not sleeping enough, but it could also be a sign of diabetes. If tiredness doesn't go away even when taking time for rest and relaxation, it's worth seeing a doctor to rule out diabetes as a potential cause.

### **6. Experiencing blurred vision**

Blurred vision isn't always simply a sign of needing new glasses. Diabetes can also cause blurred vision, as changing fluid levels can cause swelling in the lenses of the eyes, which prevents them from focusing correctly [6].

### **7. Feeling pain or numbness in feet or legs**

Numbness in the feet and legs can be a sign of nerve damage, which occurs when diabetes causes blood sugar to remain high for a long period. That same nerve damage can also cause pain or tingling in the feet.

### **8. Cuts and scrapes taking longer to heal**

High blood sugar affects blood flow, which can impact the body's ability to heal. Sores and cuts that take an unusually long time to heal may be a sign that blood sugar has been high for some time. Anyone with this symptom should see a doctor immediately [11].

#### 9. Rapid, extreme weight loss or weight gain

People with type 1 diabetes may experience rapid, significant weight gains or weight loss – without trying to do so – as an early symptom of their condition.

#### 10. Experiencing yeast infections:

This can affect both men and women, because candida, or yeast, feeds on sugar. People with diabetes have an excessive amount of sugar present in their system which makes an ideal environment for yeast to thrive [28].

### **Type 2 diabetes**

Type 2 diabetes affects approximately 90% to 95% of people with disease (CDC,2008). It occurs more commonly among people who are older than 30 years of age and obese (National Institute of Diabetes and Digestive and Kidney Disease ( NIDDK 2005) it's incidence is rapidly increasing in younger people because of the growing epidemic of obesity in children, adolescent, and young adults (CDC,2008) The two main problems related to insulin in type 2 diabetes are insulin resistance and impaired insulin secretion. Insulin resistance refers to a decreased tissue sensitivity to insulin. Normally insulin binds to special receptor on cell surface and initiates a series of reaction involved in glucose metabolism. In type 2 diabetes these intracellular reaction are diminished making insulin less effective at stimulating glucose uptake by the tissue and at regulating glucose released by liver. Although genetic factors are thought to play a role. To overcome insulin resistance and to prevent the buildup of glucose in the blood, increased amount of insulin must be secreted to maintain the glucose level at normal or slightly elevated levels. This is called metabolic syndrome, which includes hypertension, hypercholesterolemia, and abdominal obesity. If the beta cell cannot keep up with the increased demand for insulin the glucose levels rise and type 2 diabetes develops [26].

Despite the impaired insulin secretion that is characteristic of type 2 diabetes there is enough insulin present to prevent the breakdown of fat and production of ketone bodies. Therefore, DKA does not typically occur in type 2 diabetes. Uncontrolled type of diabetes 2 may lead another acute problem ( hyperglycaemic hyperosmolar nonketotic syndrome.

### **GESTATIONAL DIABETES**

Gestational diabetes mellitus (GDM) is any degree of glucose intolerance with onset during pregnancy. Hyperglycemia develops during pregnancy because of the secretion of placental hormone, which causes insulin resistance. 14% of pregnant women cause gestational diabetes mellitus due to increase the risk of hypertensive disorders during pregnancy. Initial management includes dietary

modification and blood glucose monitoring. If hyperglycemia persists, insulin is prescribed. Goals for blood glucose level during pregnancy are 105mg/dl (5.8 mmol/L) or less before meals and 130 mg/dl (7.2 mmol/L) or less 2 hours after meals (ADA, 2009a). After delivery, blood glucose levels in women with GDM usually return to normal. However, many women who have had GDM develop type 2 diabetes later in life. I.e. women who have had GDM should maintain her ideal body weight and to exercise regularly to reduce risk for type 2 diabetes [19].

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## **PREVENTION**

In 2002 the diabetes prevention program research group reported that type 2 diabetes can be prevented with appropriate changes in lifestyle. Persons at high risk for type 2 diabetes (BMI 24 or greater, fasting and postprandial plasma glucose levels elevated but not to levels diagnostic of diabetes) received either standard lifestyle recommendations plus placebo, or an intensive program of lifestyle modification. The 16 lesson curriculum of the intensive program of lifestyle modification focused on weight reduction of greater than 7% of initial body weight and physical activity of moderate intensity. It also includes designed to help patients achieve the goals of weight reduction and participation in exercise [21,29].

- 1) Cut Sugar and Refined Carbs From Your Diet. ...
- 2) Work Out Regularly. ...
- 3) Drink Water as Your Primary Beverage. ...
- 4) Lose Weight If You're Overweight or Obese. ...
- 5) Quit Smoking. ...
- 6) Follow a Very-Low-Carb Diet. ...
- 7) Watch Portion Sizes. ...

Instead, limit sugar and choose complex carbohydrates such as vegetables, oatmeal and whole grains. Quit smoking if you are a current tobacco user. Smoking can contribute to insulin resistance, which can lead to type 2 diabetes. Quitting has been shown to reduce this risk of type 2 diabetes over time [7].

## **SYMPTOMS**

Clinical manifestations depend on the patient's level of hyperglycaemia. Clinical manifestations of all types of diabetes include the "three Ps"

Polyuria (increased urination)

Polydipsia (increased thirst)

Polyphagia (increased appetite)

That results from the catabolic state include by insulin deficiency and break down of protein and fat. Other symptoms include fatigue and weakness, vision changes, dry skin and recurrent infections. Onset of type 1 diabetes may also be associated with sudden weight loss or nausea, vomiting, or abdominal [1,13].

### **CRITERIA FOR THE DIAGNOSIS OF DIABETES MELLITUS**

1) Symptoms of diabetes plus casual plasma glucose concentration equal to or greater than 200 mg/dl. casual is defined as any time of day without regard to time since last meal. The classic symptoms of diabetes include polyuria, polydipsia, and unexplained weight loss

Or

2) Fasting plasma glucose greater than or equal to 160 mg/dl. Fasting is defined as no caloric intake for at least 8 hours

Or

3) Two hours postload glucose equal to or greater than 200 mg/dl during an oral glucose tolerance test. The test should be performed as described by the World Health Organisation, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.

### **MEDICAL MANAGEMENT**

The main goal of diabetes treatment is to normalize insulin activity and blood glucose level to reduce the development of vascular and neuropathic complications. The Diabetes Control and Complications Trial (DCCT) 10 year clinical trial conducted from 1983 to 1993 demonstrated the importance of achieving blood glucose control in the normal, nondiabetic range. This landmark trial demonstrates that intensive glucose control dramatically reduced the development and progression of complications such as retinopathy, nephropathy, and neuropathy. Intensive treatment is defined as three or four insulin injections per day or continuous subcutaneous insulin infusions pump therapy plus frequent blood glucose monitoring and weekly contacts with diabetes educator. American Diabetes Association now recommends that all the patients with diabetes strive for glucose control to reduce their risk for complications (ADA 2009b)

A study conducted in the United Kingdom demonstrates a decrease in complications among patients with type 2 diabetes receiving intensive therapy compared to those receiving conventional therapy (United Kingdom Prospective Diabetes Study Group (UKPDS), 1998; see also ADA, 2009b).

### **NUTRITIONAL THERAPY**

Nutrition, meal planning, and weight control are the foundation of diabetes management. The most important objective in the dietary and nutritional management of diabetes is control intake to attain or maintain a reasonable body weight, control of blood glucose level, and normalisation of lipids

and blood pressure to prevent heart disease. Nutritional management of diabetes includes the following goals (ADA, 2008b) [13].

1) To achieve and maintain

a) blood glucose level in the normal range or as close to normal as is safely possible

b) a lipid and lipoprotein profile that reduces the risk for vascular disease

c) blood pressure levels in the normal range or as close to normal as is safely possible

2) To prevent or at least slow the rate of development of the chronic complications of diabetes by modifying nutrient intake and lifestyle.

3) To address individual nutrition needs, taking into account personal and cultural preferences and willingness to change

4) To maintain the pleasure of eating by only limiting food choices when indicated by scientific evidence.

### **MEAL PLANNING AND RELATED TEACHING**

The meal plan must consider the patient's food preferences, lifestyle, usual eating times, and ethnic and cultural background. For patients who require insulin to help control blood glucose level, maintaining as much consistency as possible in the amount of calories and carbohydrates ingested at each meal is essential [17].

a) caloric requirements

b) caloric distribution

c) food classification system

d) other dietary concerns

1) alcohol consumption

Patients with diabetes do not need to give up alcoholic beverages entirely, but they and health care professionals must be aware of the potential adverse effects of alcohol specific to diabetes.

2) Sweeteners

Use of artificial sweeteners is acceptable especially if it assists in overall dietary adherence. Moderation in the amount of sweeteners used is encouraged to avoid potential adverse effects.

e) EXERCISE

Exercise is extremely important in diabetes management because of its effects on lowering blood glucose and reducing cardiovascular risk factors. Exercise lowers blood glucose levels by increasing the uptake of glucose by body muscles and improving insulin utilization [3,20].

1) Exercise recommendations

2) exercise precautions

### **PATIENT EDUCATION**

General precautions for exercise in people with diabetes

- a) use proper footwear and appropriate other protective equipment
- b) avoid exercise in extreme heat or cold
- c) inspect feet daily after exercise
- d) avoid exercise during periods of poor metabolic control.

## **INSULIN**

The importance of insulin

Insulin is a hormone made in your pancreas, a gland located behind your stomach. It allows your body to use glucose for energy. Glucose is a type of sugar found in many carbohydrates.

After a meal or snack, the digestive tract breaks down carbohydrates and changes them into glucose. Glucose is then absorbed into your bloodstream through the lining in your small intestine. Once glucose is in your bloodstream, insulin causes cells throughout your body to absorb the sugar and use it for energy [22].

Insulin also helps balance your blood glucose levels. When there's too much glucose in your bloodstream, insulin signals your body to store the excess in your liver. The stored glucose isn't released until your blood glucose levels decrease, such as between meals or when your body is stressed or needs an extra boost of energy

## **CONCLUSION**

Diabetes is a constant condition related with unusually significant degrees of sugar (glucose) in the blood. Insulin created by the pancreas brings down blood glucose. Nonappearance or lacking creation of insulin causes diabetes. The two sorts of diabetes are alluded to as type 1 (insulin ward) and type 2 (non-insulin subordinate). Side effects of diabetes incorporate expanded pee yield, thirst and appetite just as weariness. Diabetes is analyzed by (glucose) testing. The significant entanglements of diabetes are both intense and constant. Intensely: hazardously raised glucose, strangely low glucose because of diabetes prescriptions might happen. Persistently: illness of the veins (both little and huge) which can harm the eye, kidneys, nerves, and heart might happen Diabetes treatment relies upon the kind and seriousness of the diabetes. Type 1 diabetes is treated with insulin, work out, and a diabetic eating regimen. Type 2 diabetes is first treated with weight decrease, a diabetic eating routine, and exercise. At the point when these actions neglect to control the raised blood sugars, oral prescriptions are utilized.

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