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AN OVERVIEW: MACRONUTRIENTS IN DEVELOPMENT AND MANAGEMENT OF DIABETES

L.VAISHNAVI[1], Dr. K. DIVYA[2]

[1] B.PHARM
[2] PHARM.D
PALLAVAN PHARMACY COLLEGE DEPARTMENT OF PHARMACOLOGY

ABSTRACT:

Over 460 million people globally suffer with diabetes. This is commonly known as diabetes mellitus. It is a chronic metabolic disease. High blood glucose is a main symptom. With time, elevated blood sugar levels cause damage. This happens to many bodily systems. Particularly it affects blood vessels and neurons.

Several factors influence onset and treatment of diabetes. Nutrition lifestyle and heredity are among them. Among dietary elements macronutrients are crucial. They are needed to manage insulin sensitivity. They help regulate blood sugar levels. They tackle cardiovascular risk issues.

The article aims to provide a general understanding. It looks at the link between macronutrients and diabetes. It underlines that diets heavy in fat protein and carbohydrates have an effect. These diets can influence the start of diabetes. They can also affect the treatment of the condition.

KEYWORDS: Diabetes, macronutrients, carbohydrates, protein, fat.

INTRODUCTION:

Diabetes is a long-term condition. It is characterized by high blood sugar levels and abnormal protein and fat metabolism. It occurs when the body is not able to use insulin efficiently. It also occurs when the pancreas cannot produce enough insulin to meet the body's needs. The hormone controlling glucose levels in blood is known as insulin.

Hyperglycemia is a disorder. It is caused by ineffective or absent insulin. This disorder increases blood sugar levels. Over time this causes serious harm to the body. According to study by NCD Risk Factor Collaboration (NCD-RisC) and World Health Organization (WHO), there were 830 million diabetics in 2022. This number is up from 200 million in 1990.

In 2022 over half of individuals with diabetes did not take their medicine. The primary causes of the rise in prevalence of diabetes are obesity, dietary alterations, nutritional transitions and lifestyle modifications.

Three primary nutritional groups known as macronutrients are needed. In significant quantities they maintain bodily growth. They also help in maintenance and in supply of energy.

Types of Macronutrients:

1. 1.Carbohydrates are simple or complex sugars. They exist as single monosaccharides or as chains of linked monosaccharides. Starch is an example.
2. Proteins: Amino acid chains make up proteins. Two types of amino acids exist. They are essential and non-essential.
3. Fats: Fatty acids and glycerol make up fats.

The significance of macronutrients:

1. Energy Production: The body employs macronutrients to fuel numerous processes.
2. Growth and Maintenance: Growth and maintenance of tissues are aided by macronutrients.
3. Control of Body Functions: Macronutrients play a role in controlling several body processes. They control secretion of hormones and blood sugar levels.

A review is necessary to provide an overview of the available data. This data is about the links between macronutrients and diabetes. We need to note how macronutrients influence insulin sensitivity. Also they have an impact on glucose metabolism and weight control.

MACRONUTRIETS IN DIABETES DEVELOPMENT AND MANAGEMENT:

1. CARBOHYDRATES IN DIABETES:

Carbohydrates are prime source of energy for our body. They exist in various forms. Forms include simple sugars complex starches and fiber. Quality and quantity of carbohydrate intake play a crucial role. They help regulate blood sugar levels and insulin sensitivity.

Types of Carbohydrates:

1. Simple Carbohydrates: Simple sugars are quick to absorb. They include sucrose fructose and glucose. These types of sugars can raise blood sugar levels.
2. Complex Carbohydrates: Starches in whole grains, legumes and vegetables break down slowly. As a result, they cause blood sugar to rise gradually.
3. Fiber. This is a type of complex carbohydrate and it slows down body's absorption of carbohydrates. The substance is indigestible. It helps to control blood sugar levels.

Glycemic Index and Load:

Glycemic index (GI) and glycemic load (GL) illustrate the rate at which carbs boost blood sugar levels. These concepts are important to diabetes patients. GI is a measure of the speed at which carbohydrates raise blood sugar. Higher values indicate faster rise.

On the other hand GL is a more accurate indicator of a food's impact on blood sugar. It is a measure of total carbohydrate amount and its GI. The rate at which carbohydrates elevate blood sugar is signaled by glycemic index (GI) and glycemic load (GL).

1. Glycemic Index (GI): It's a measurement of the rate at which blood sugar increases due to carbohydrates. Higher values suggest quicker rise.
2. Glycemic Load (GL): A precise indicator of food's effect on blood sugar levels is Glycemic Load. It's a measure of total carbohydrate amount in food, combined with its GI value.

Carbohydrates in diabetes development:

1. High glycemic index carbs: Glycemic index carbs of a high nature can have negative effects. These are the carbohydrates found in foods like white bread and sugar-filled beverages. When consumed they can quickly elevate blood sugar levels. It increases the risk of type 2 diabetes through insulin resistance.

2. Low intake of fiber:

Fiber intake is also important. It enhances one's sensitivity to insulin and helps with blood sugar level regulation. A diet that is low in fiber is problematic. It is associated with higher rates of type-2 diabetes.

Carbohydrates in diabetes management:

They are an important factor that shapes blood sugar levels. Once glucose is broken down it travels into the bloodstream. It rides on the quantity and type of carbs consumed. This impacts the process of managing blood sugar.

Select complex carbs. They are healthy. Also unprocessed. In addition they are high in fiber. They have vitamins and minerals. Fruits are included. Vegetables, whole grains too. Their sluggish digestion leads to a gradual rise in sugar levels.

Simple carbs should be restricted. Sweets and refined cereals fall in this category. So do sugar-filled beverages. They are rich in added sugars and empty calories. Upon consumption these cause a quick surge in blood sugar levels. Inflammation and insulin resistance are the resulting issues.

Recommendations for Carbohydrate Intake in Diabetes Management :

1. American Diabetes Association (ADA) advises that 45–65% of daily calories must come from carbs.
2. Best to Choose Low-GI Carbs: Prioritize complete unprocessed foods. Focus on fruits vegetables, grains.
3. Adjust Carb Intake to Satisfy Personal Needs: Account for many factors. For example blood glucose goals, medicine schedule, level of activity.

Best Sources of Carbohydrates:

1. Full Grains: whole wheat bread brown rice, quinoa and whole grain pasta
2. Fruits: Citrus fruits, stone fruits berries and apples
3. Vegetables: carrots bell peppers, broccoli and leafy greens
4. Legumes: kidney beans, black beans, chickpeas and lentils

PROTEINS IN DIABETES :

Proteins are vital for growth and repair of body tissues. They can also boost insulin sensitivity. Additionally they assist in controlling blood sugar levels.

Types of Protein

1. Animal-Based Protein: Present in dairy products, meat poultry fish and eggs.
2. Plant-Based Protein: It is included in seitan. Tofu, tempeh beans lentils and legumes also have protein.

Protein in diabetes development:

1. 1.High protein intake: Eating lots of protein has been linked to a higher risk of type 2 diabetes. This is especially true for protein from animal sources. The link is presumably due to inflammation and insulin resistance.
2. 2.Low-quality protein sources: Processed meats and other low-quality protein sources contain high levels of advanced glycation end products. They are known as AGE products. AGE products can cause oxidative stress and inflammation. Eating these foods is tied to an elevated risk of type 2 diabetes.

Protein in Diabetes Management

1. Regulate Blood Sugar through Protein: Protein can decrease the pace at which sugar goes into the bloodstream.
2. Boosting Sensitivity to Insulin: Protein can boost insulin sensitivity. It makes glucose absorption by cells easier.
3. Assist in Managing Weight: Protein can assist in weight loss and upkeep. It is crucial in the management of diabetes.

Recommendations for Protein Intake :

1. Association of Diabetes in America (ADA): It advises that 15-20% of daily calories come from protein.
2. Lean Protein Sources: Focus on lean protein sources. These include poultry fish and plant-based proteins.
3. Limit Saturated Fat Intake: To limit saturated fat intake, focus on protein sources like meat and full-fat dairy products.

Best Sources of Protein :

1. Lean Meats: These include chicken turkey, lean beef, pork tenderloin.
2. Fish and Seafood: This category includes salmon tilapia. Shrimp. Lobster.
3. Legumes: Lentils chickpeas, black beans. Kidney beans.
4. Plant-Based Protein Powder: Pea protein. Hemp protein. Brown rice protein.

Protein and Blood Sugar Control:

3.FATS AND DIABETES:

1. Timing of Protein Intake: Regulation of blood sugar levels can occur by incorporating protein into meals. Also into snacks.
2. Protein Intake: Increasing sensitivity to insulin can be achieved with protein intake. In adequate amounts and at the right times.

The reason is protein aids in absorption of glucose. This can have an effect on control of blood sugar. Its use is not limited to main meals. Snacks are good opportunities to get a protein boost. Ensuring the body has a regular supply throughout day is vital. It keeps blood sugar levels stable.
A balanced diet should contain fats. They provide energy and help body absorb vitamins. Not all fats are equal. Some may harm treatment of diabetes.

TYPES OF FAT :

1. Saturated Fat: Present in tropical oils like coconut and palm oil, as well as animal goods like meat, poultry, and full-fat dairy products.
2. Plant-based foods such as avocados, almonds, seeds, and olive oil provide unsaturated fat.
3. Trans Fat: Present in several baked goods, snack foods, and processed and fried foods.

Fats and Diabetes Development

1. Saturated and trans fats: Consuming high amounts of saturated and trans fats, particularly from animal sources and processed foods, has been linked to an increased risk of developing type 2 diabetes, possibly due to increased insulin resistance and inflammation.
2. Low omega-3 fatty acid intake: Consuming low amounts of omega-3 fatty acids, particularly from fatty fish, has been associated with an increased risk of developing type 2 diabetes, possibly due to increased inflammation and oxidative stress.

Fat in Diabetes Management :

1. Energy Source: The body uses fat as a major source of energy.
2. Inflammation: Certain fats, such as omega-6 fatty acids, might exacerbate insulin resistance and problems from diabetes by increasing inflammation in the body.
3. Insulin Sensitivity: Certain fats, such as omega-3 fatty acids, can lower inflammation and increase insulin sensitivity.
4. Select good fats: Nuts, seeds, avocados, and olive oil all include unsaturated fats that promote heart health and enhance insulin sensitivity.
5. Cut back on bad fats: Trans and saturated fats, which are present in processed meats, full-fat dairy products, and fried foods, raise insulin resistance and inflammation.

Recommendations for Fat Intake

1. The American Diabetes Association (ADA) advises consuming no more than 7% of daily calories from saturated fat.
2. Select Unsaturated Fats: Pay attention to unsaturated fats, such as those in avocados, nuts, seeds, and olive oil.
3. Limit Trans Fat Intake: Avoid trans fats by limiting processed and fried foods.

Best Sources of Healthy Fats

1. Nuts and Seeds: flaxseeds, chia seeds, walnuts, and almonds
2. Monounsaturated fats are abundant in avocados.
3. Omega-3 fatty acid-rich fatty fish, such as mackerel, sardines, and salmon
4. High in monounsaturated fats is olive oil.

Fat and Blood Sugar Control

1. Timing of Fat Intake: Blood sugar levels can be controlled by consuming healthy fats at meals and snacks.
2. Amount of Fat Intake: Eating enough good fats can help you become more insulin sensitive.

Macronutrient Ratios and Diabetes

The optimal macronutrient ratio for managing diabetes varies based on personal requirements and health objectives. But a well-rounded diet that consists of:

Between 45 and 65 percent carbs: Give priority to complete, unprocessed foods such as fruits, vegetables, and whole grains.

Lean protein sources, such as fish, chicken, and lentils, should make up 15–25% of your diet.

20–35% fat: Place a focus on good fats like avocados, nuts, seeds, and olive oil.

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