CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

SJIF Impact Factor: 7.187

https://doi.org/10.5281/zenodo.7078782

Available online at: http://www.iajps.com *Research Article*

IMPACT OF QUALITY OF DIET FOR PATIENTS WITH TYPE 2 DIABETES MELLITUS, ON PATIENT HEALTH

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Article Received: March 2021 **Accepted:** March 2021 **Published:** April 2021

Abstract:

Nutritional factors are of vital significance in the treatment and prevention of type 2 diabetes. We conducted a thorough search of biomedical databases, Medline and Embase, for research on type 2 diabetes mellitus (T2DM) disease published in English up to December 2020. Dietary consumption plays a role in both the etiology and management of type 2 diabetes mellitus (T2DM), and it is also an important modifiable risk factor. Dietary consumption, defined by a high intake of energy as well as nutrients such as fat and sugar, along with a low intake of fiber, has been shown to increase the risk of heart disease in T2DM. In patients with diabetes, medical nutrition therapy should help them achieve and maintain normal blood sugar levels, a lipid/lipoprotein profile, and blood pressure levels that are normal or as close to normal as is safely possible. In order to maintain the joy of eating, a patient's specific food preferences must be addressed while constructing a medical nutrition therapy, resulting in the development of a custom-made diet.

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Please cite this article in press Hadeel Khaled Makkawi et al ***Impact Of Quality Of Diet For Patients With Type 2 Diabetes Mellitus, On Patient Health.,*** *Indo Am. J. P. Sci, 2021; 08(04).*

INTRODUCTION:

Diabetes mellitus (DM) persistent hyperglycemia and impaired carbohydrate, lipid, and protein metabolism caused by whole or partial insufficiency of insulin excretion and/or insulin activity Diabetes is classified into two types: insulin-dependent diabetes mellitus (T1DM) and non-insulin-dependent diabetes mellitus (NIDM) (type 2 diabetes mellitus, T2DM). T2DM is the most common type of diabetes, accounting for 90% to 95% of all diabetic individuals and anticipated to rise to 439 million by 2030 [1]. T2DM is caused primarily by the interplay of inherited, environmental, and other risk factors.

As a result, implementing effective T2D avoidance strategies, as well as early detection programs, is critical to reducing the condition's health burden [2]. To avert the beginning of T2D at a young age and to reduce the lifetime risk of developing T2D, optimal diet selection and nutritional parameters have been identified to have an important impact. Previous meta-analyses of potential studies found that whole grains were associated with lower T2D risk, but red meat, processed meat, and sugar sweetened drinks (SSB) were associated with increased risk [2],[3].

Among dietary recommendations for DM, the complying with dietary structure is suggested: 45 to 60% of everyday calories from total carbohydrates, 15 to 20% of daily calories from protein, and 25 to 35% of day-to-day total calories from lipids. The latter are classified as follows: 7% of daily calories from saturated fatty acids (SFA), approximately 10% of daily calories from polyunsaturated fatty acids (PUFAs), 5 to 15% of daily calories from monounsaturated fatty acids (MUFAs), and less than 300 mg of daily cholesterol [4]. The minimum nutritional fiber recommendation is 14 g per 1000 kcal, with whole grains, vegetables, and fruits receiving top priority [4]. According to Brazilian guidelines, the recommended intake of vitamins and minerals is for people who do not have diabetes, while sodium intake should not exceed 2000 mg per day, which is comparable to 5 g of food preparation salt [4],[5].

T2DM is a chronic metabolic condition in which frequency has actually been enhancing gradually throughout the globe. And stays a significant reason for morbidity and death worldwide. Nutritional factors are of vital significance in the management as well as prevention of type 2 diabetes.

METHODOLOGY:

We conducted a thorough search of biomedical databases, Medline and Embase, for research on type 2 diabetes mellitus (T2DM) disease published in English up to December 2020. The keywords we selected in our database search were "Diabetes mellitus," "dietary management," and "evaluation." More relevant publications were found by examining the references lists of each included study.

DISCUSSION:

Type 2 diabetes is caused primarily by lifestyle factors and genes [4]. A number of lifestyle factors are known to be important in the progression of type 2 diabetes. These include a lack of physical activity, a sedentary lifestyle, cigarette smoking, and excessive alcohol intake. Obesity has been linked to around 55% of type 2 diabetes occurrences [6]. The rise in childhood obesity between the 1960s and the 2000s is likely to have contributed to an increase in type 2 diabetes in children and adolescents [7]. Environmental toxins may contribute to the current boosts in the rate of type 2 DM. A weak positive correlation has been found in between the concentration in the urine of bisphenol A, a component of some plastics, as well as the occurrence of type 2 DM [8]. There is a solid inheritable hereditary link in type 2 DM, having family members (specifically first degree) with type 2 DM raises the dangers of establishing type 2 DM considerably. Concordance among monozygotic twins is close to 100%, as well as concerning 25% of those with the condition have a family history of DM [9].

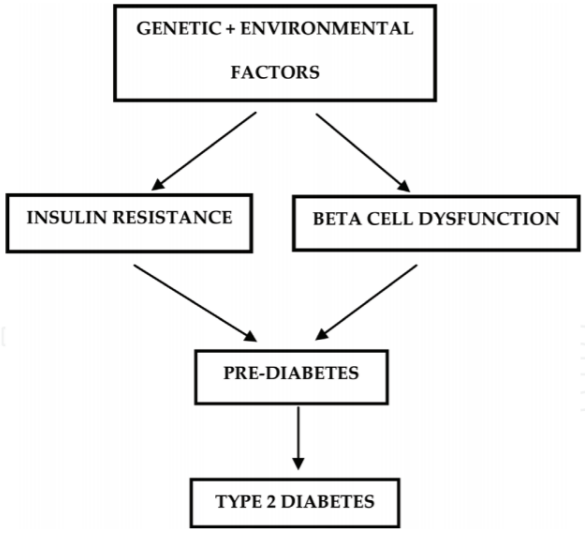

Figure 1. Pathway to acquire T2DM [5].

Table 1. Etiology of T2DM [4-9].

Genetic factors of DM2
Genetic defects in insulin secretion
Genetic defects of insulin resistance
Environmental factors of DM2
Obesity
Aging
Psychological stress
Diet and nutrients
Glucotoxicity and lipotoxicity
Endoplasmic reticulum stress and endothelial dysfunction
Deficit in insulin secretion
Insulin resistance (IR)
IR in the liver
IR in adipose tissue
IR in the muscle

- **FOOD QUALITY ASSESMENT**

Food frequency questionnaires are created to Determine a conventional long-term diet plan rather than providing a specific estimate of temporary intake [10]. A food frequency questionnaire's low cost and ease of administration make it suitable for usage in large populations. Since 1979, a semiquantitative food frequency questionnaire has been developed; an early 61-item variation was discovered to provide a practical stage of dietary consumption amongst female nurses when compared to four one-week diet regimen records [11],[10]. A later variation with 116 items was discovered to offer a comparable level of validity for investigating diet 3-4 years ago [12].

The questionnaire was designed to categorize people based on their average daily consumption of selected nutrients over the previous year. Dietary variables approximated by the survey included calories, total fat, different types of fats and also sugars, vitamins, protein, alcohol and also caffeine.

Nutrient consumptions are computed from the questionnaire by multiplying a weight designated to the frequency of use (where when each day is equal to one) by the nutrient composition for the part size defined for every food or vitamin supplement. Nutrients are summation throughout all foods as well as vitamins to acquire an overall nutrient intake for every individual.

The Dietary Approaches to Stop Hypertension (DASH) diet plan, which is high in vegetables and fruits, moderate in low-fat dairy products, low in animal protein, but high in plant protein from beans and nuts, significantly lowers both systolic and diastolic blood pressure in hypertensive and normotensive persons [13].

While DASH was primarily designed to help people avoid and manage hypertension, it is now recommended for the dietary treatment of T2D [13]. Adherence to DASH has a positive effect on glycemic control, weight, and hypertension, all of which are important indications of risk for diabetes-related complications [13,14,15].

DASH scores are computed utilizing the common scoring tool developed by Fung et alia [16,17]. The simple tracking application generates a score ranging from 8 to 40 points, with 40 signifying optimal compliance with the DASH dietary pattern [17]. The DASH score is calculated by adding the number of daily portions of seven dietary components: fruits, vegetables, nuts and legumes, whole grains, low-fat dairy products, red and processed meats, added sugar, and sodium intake. Individuals are recognized for each and every part based on their intake position. Higher scores are obtained by eating more fruits and vegetables, low-fat dairy products, whole grains, nuts, and legumes. Consumption of sodium, red and processed meats, and sugarcoated foods is increasing in reverse, as these are less desirable items [17]. The most affordable quintile is offered a score of 5 points and also the greatest quintile is provided a score of 1 factor. The parts scores are after that summed to give a total DASH score [17]. The scoring requirements for the DASH-style diet plan is detailed in Table 2.

Table 2. Dietary Approaches to Stop Hypertension (DASH) dietary pattern scoring criteria [17].

Component	Foods	Scoring Quintiles (Q) *
Fruits	All fruits and fruit juices	Q1 = 1 point
Vegetables	All vegetables except potatoes and legumes	Q2 = 2 points
Nuts and legumes	Nuts and peanut butter, dried beans, peas, tofu	Q3 = 3 points
Whole-grains	Brown rice, dark breads, cooked cereal, whole-grain cereal, other grains, popcorn, wheat germ, bran	Q4 = 4 points
Low-fat dairy	Skim milk, yogurt, cottage cheese	Q5 = 5 points
Sodium	Sum of sodium content of all foods	Q1 = 5 points Q2 = 4 points
Red and processed meats	Beef, pork, lamb, deli meats, organ meats, hot dogs, bacon	Q3 = 3 points Q4 = 2 points
Added sugar	Foods and beverages with added sugars (i.e., sugar sweetened beverages)	Q5 = 1 point

* Q1 represents low consumption and Q5 represents high consumption.

❖ Diabetes Healthy Eating Index (DHEI)

The DHEI consists of 10 elements: 6 food categories, three elements describing "percent day-to-day calorie intake from lipids", "dietary cholesterol", and also "trans fats"; as well as a "diet selection" component [18,19,20]. For the final component, each meal was counted only when consumption exceeded 50% of the recommended intake in the matching food group. Each element received a score, the value of which is defined based on adherence to current national dietary recommendations for DM, namely "inadequate" (no points), "fair" (one-half point), and "good" (one point) [20]. The sum of each element's ratings produces a general score of excellent diet quality, which is transformed on a scale of zero to 100. Table 4 thoroughly explains the DHEI. The total diet plan high quality is classified as poor (51%), needs improvement (51-80%), or sufficient (> 80 components) in both measures [21].

Table 4. Diabetes Healthy Eating Index (DHEI) components and criteria for adherence [20].

Components (daily intake)	**Portion (kcal)**	**Criteria for adherence with diabetes recommendations**		
		Poor	**Fair**	**Good**
1. Diet variety: number of items	–	< 6	6–16	≥16
2. Fresh fruit (portions per 1000 kcal)	70	< 1.0	1.0–1.5	≥1 ½
3. Vegetables (portions per 1000 kcal)	15	< 1.0	1.0–1.5	≥1 ½
4. Carbohydrates and fiber sources (portions per 1000 kcal)	150	< 3	< 3 BUT at least 50% from fiber sources	≥3 AND at least 50% from fiber sources
5. Meat and eggs (portions per 1000 kcal)	190	>1.0	0.5–1.0	≤0.5
6. Dairy products (portions per 1000 kcal) AND saturated fatty acids (% of energy)	120	< 0.75 portion/day of dairy OR saturated fatty acids intake > 10.5% of energy	> 0.5 portion of dairy AND Saturated Fatty Acids < 7.0% of energy OR > 0.75 portion of dairy AND saturated fatty acids between 7.0 and 10.5% of energy	1.0–2.0 portions/day of dairy AND saturated fatty acids < 7% of energy
7. Oils, fats, and nuts (portions per 1000 kcal)	73	> 1.0	0.5–1.0	≤0.5
8. Total lipids (% of energy)	–	≥45%	30–45%	≤30%
9. Dietary cholesterol (mg/day)	–	≥450	300–450	≤300
10. *Trans*-unsaturated fatty acids (% of energy)	–	≥1.5%	1.0–1.5%	≤1.0%

- **PREVENTATIVE DIET MODIFICATION**

Preventative Diabetes research studies have actually shown that nutrient composition is crucial element to avoid the progression of T2DM [22,23]. Epidemiological research studies have recommendations that the risks of developing diabetes mellitus can be increased or decreased due to nutritional aspects. The nutritional elements which might enhance the diabetes danger are ingestion in big amounts of refined grains, sugar-sweetened beverages, red and also processed meat and alcohol, and those with the contrary results are the consumption of whole-grain cereal, vegetables, dairy, beans, nuts, separately of body weight change [24,25]. A lot of prevention research studies concerning dietary aspects have been conducted in several countries during the last numerous years. Studies from China, Japan and also India targeted at examining the effects of minimizing fat, polished carbohydrates as well as alcohol and raising fiber consumption on the development of T2DM [25],[26]. The Finnish Diabetes Prevention Study advocated decreasing total and saturated fat consumption as well as enhancing fiber density in the diet regimen [27]. In the Diabetes Prevention Program, aim of nutritional program were

to reduce overall level of fat as well as energy consumption [28]. A Mediterranean diet program defining by a high intake of vegetables, fruit, beans, extra virgin olive oil, nuts, fish, whole grains and red wine also revealed an exceptional decrease in the incidence of diabetes mellitus in a Spanish study [29]. Although diet plan is quite variable owing to food schedule, personal choices as well as different background, a basic policy can be acquired: a high intake of vegetables, fruits and also vegetable fats; nuts, beans, dairy products and also fish must be taken as supplement for sufficient body protein; grain products unrefined and with high all-natural fiber material need to be generally chosen; red meat and also very processed foods need to be limited.

CONCLUSION:

Dietary consumption plays a role in both the etiology and management of type 2 diabetes mellitus (T2DM), and it is also an important modifiable risk factor. Dietary consumption, defined by a high intake of energy as well as nutrients such as fat and sugar, along with a low intake of fiber, has been shown to increase the risk of T2DM. A quantifiable food frequency questionnaire can provide information on food consumption (FFQ). Reported consumption can be converted to daily consumption, and diet quality can be assessed using several indicators. Nutritional indexes are valuable tools in clinical practice because they allow for the evaluation of entire diet regimen quality using a variety of dietary products. Furthermore, it helps improve dietary routine therapy by focusing on the nutritional factors that demand improvement in nutritional compliance. Nonetheless, to the best of our knowledge, there is no uniform reference for assessing diet plan quality in patients with diabetes.

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