Step by Step in Management of Type 2 Diabetes

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ABSTRACT

A group of widespread metabolic disorders that possess the phenotype of hyperglycemia has been referred to as Diabetes mellitus. Recently, type 2 diabetes has been abounding much more quickly, probably due to the growing rate of obesity, decreased levels of physical activity as the world has got more industrialized, and also the aging of the population. The comprehensive care of type 2 diabetes requires an emphasis on nutrition, exercise, and monitoring glycemic control which usually involves glucose- lowering medication. As type 2 diabetes develops to the level of relative insulin deficiency, and one or two oral glucose-lowering agents become ineffective for glycemic control, it should be treated with insulin. In this study, 200 patients with type 2 diabetes were randomly selected. The treatment period (diet, exercise, oral medication and insulin) was evaluated in these patients. In this study, the mean FBS and Hb A1c were studied in different periods. The rate of mean FBS and HbA1c before the onset of insulin therapy was 185±75.4 (mg/dl) and 9.6±3.1 (%); respectively. Although type 2 diabetes is a chronic and progressive disease, it can be controlled well. In the screening program of diabetes, patients can be diagnosed earlier and prevented from the complications of diabetes.

Key Words: *Type 2 Diabetes, Medication, Insulin Therapy, Diet Therapy, Oral Agent.*

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INTRODUCTION

Diabetes mellitus is one of the most common health problems faced by mankind, and is a major public health problem. [1] Globally, 90% of the reported cases of diabetes has been Type 2 diabetes mellitus, which indicates that this type has been the predominant form of diabetes worldwide. [2] Therefore, it seems necessary to take great actions to prevent diabetes complications and decrease the global load of diabetes which is presently afflicting more than 425 million people, that one-third of them are older than 65 years. [3] Although, the incidence of this disease has begun to decrease in some rich countries, if no action is taken, the number of people suffering diabetes may rise to 693 million in 2045. Additionally, there are 352 million people with impaired glucose tolerance who are at high risk of developing diabetes. [4]

In 2017, approximately 38.7 (27.1-51.4) million people, or 9.6% (6.7-12.7) of adults aged 20-79 years have been living with diabetes in Middle East and North African Region. About 49.1% of these have been undiagnosed. [4] The pathogenesis of type 2 diabetes is complex, in which the inter-relation of genetic and environmental factors is involved. Several environmental factors have been indicated to play a critical role in the development of the disease, which particularly caused by the excessive caloric intake resulted from obesity and a sedentary lifestyle. [1] Prospective, randomized clinical trials have reported improved rates of microvascular problems in patients suffering from type 2 diabetes treated to lower glycemic targets. [5]

To treat patients with type 2 diabetes, the medication should be taken along with diet and exercise. [6] The available oral antihyperglycemic agents can be divided by the mechanism of action into several groups: insulin

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sensitizers mainly acting in the liver, insulin sensitizers mainly affecting the peripheral tissues, insulin secretagogues, agents that delay the absorption of carbohydrates, insulins, agents that increase the activity of the incretin system, and agents that increase glucose clearance in the urine. Insulin therapy in patients with type 2 diabetes effectively has been a supplement to the endogenous insulin secretion. [7]

Patients with type 2 diabetes need insulin after several years. This time has been reported differently in several studies. In an article presented in 2002, the step-by-step approach to type 2 diabetes was identified. In this paper, the time of diagnosis and the start of diet and oral medication were 4 years. The treatment initially began with one pill, and then several oral antihyperglycemic agents were started for the patients. After 9 years of taking the oral antihyperglycemic agents, the treatment also failed, and the patients required insulin therapy. [8] In this study, the deny of patients was the cause of the delay in starting insulin.

When dietary restrictions and lifestyle modifications along with oral hypoglycemic agents were not able to control the disease metabolically, the treatment with Insulin should be started. [9]

The present investigation aimed at identifying the duration of each medication (diet, exercise, oral medication and insulin) in type 2 diabetic patients.

MATERIAL AND METHOD:

In this study, 200 patients with type 2 diabetes were randomly selected. Patients had been treated with step-by-step of diabetic diet, oral antihyperglycemic agents, and eventually insulin was started for them. Also, the duration of the diet and oral antihyperglycemic agents administration, as well as their dose, and the duration of conversion to insulin were studied.

RESULTS

Two hundred patients of type 2 diabetes were enrolled (64% female and 36% male). The mean ± SD age of the onset of insulin therapy BMI has been shown in table 1.

Table 1: Demographic parameters in 200 diabetic patients

Sex	Number (%)	Age of onset of insulin years	BMI
Female	128 (64)	56.6±12.2	27.1±7.2
Male	72 (36)	56.9±14.7	26.8±6.9

One hundred percent of the patients were treated with diet as first-line treatment, and 94% were treated with single oral antihyperglycemic agents. Six percent of them were initially controlled with multiple drugs (see Table 2).

Table 2: Duration of diet and oral antihyperglycemic agents in type 2 diabetes

Duration years	Diet (%)	OHA (%) Single drug	OHA (%) multiple drugs
Less than 1	82	9	14
1-3	14	24	24
4-7	5	40	12
8-11	1	18	4
12-15	-	3	4
total	100	94	58

Glibenclamide was the first and the most commonly used drug as a single and combination therapy (88%) in diabetic patients, and the second drug as a single and combination therapy (77%) was metformin.

In this study, the mean FBS and Hb A1c were studied in different periods. The rates of mean FBS and HbA1c before the onset of insulin therapy were 185±75.4 (mg⁄dl) and 9.6±3.1 (%); respectively (see Table 3).

Table 3: Mean FBS and Hb A1c in 200 diabetic patients

parameters	FBS (Mean±Sd) (mg⁄dl)	Hb A1c(Mean±Sd) (%)
At the time of Diet	115±53.5	7±3.2
At the time of OHA (Single therapy)	158±69.8	7.8±2.9
At the time of OHA (Multiple therapy)	145±68.3	8.6±2.8
Before insulin therapy	185±75.4	9.6±3.1

In this study, the median diet therapy was about 8 months, and the medication with single oral antihyperglycemic agents was 5 years, and the medication with multiple oral antihyperglycemic agents was 3 years (see Figure 1).

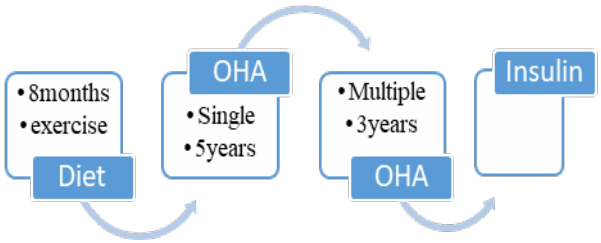

Fig. 1: Time of diet therapy and oral antihyperglycemic agents until the onset of insulin therapy.

DISCUSSION

Diabetic patients require accurate blood glucose control, and their blood sugar should be maintained at the optimal level. Although, diet, weight reduction, and exercise can all be effective in controlling glycemic, most of the patients

suffering from type 2 diabetes will need medication to treat their disease. [5] Although, many patients primarily respond to the oral therapy, they fail to keep target A1C levels. When the glycemic goals are not achieved with a single agent, the patient should be analyzed for the related causes, like having problem in taking the medication, side effects, or poor understanding of the nutrition plan. In patients that need more than one agent, pill-dosing dispensers might be helpful in improving the adherence. As an alternative, family members or caregivers can be asked to help in administering the medication. The indications of the second agent and therapeutic options for patients who fail initial therapy with lifestyle intervention, metformin or sulfonylurea, have been similar in the elderly and younger patients. [10]

The first steps in the treatment of diabetic patients are diet and exercise, and the oral antihyperglycemic agents should be used after this period. The majority of patients would finally need insulin therapy to keep glycemic control. [11] When Insulin is used in proper doses, it can reduce any level of HbA1C to near goal, and its only limitation is the probability of causing hypoglycemia. The majority of type 2 diabetic patients would finally require insulin, but the onset of insulin is sometimes delayed. [11]

In this study, 200 type 2 diabetic patients were evaluated. All of them were treated with insulin. Most of the patients were female (64% versus 34%) as in other studies, the dominance of females was reported.

Diet therapy is the first step in the treatment of type 2 diabetes, and in fact, one of the foundations of the therapy. Basically, for all the patients, a diet should be considered for 3 to 6 months, and if blood glucose levels could not be controlled, then the medication should be started. In several articles, the maximum duration of the diet therapy was 3 years, and in our study, only 18% were initially on the diet which lasted only 8 months.

Eighty-two percent of the patients started oral antihyperglycemic agents from the beginning. The reason for this problem was that in Iran, due to the lack of screening methods for patients, they are diagnosed when they have had diabetes for many years, and at this stage, they would not respond to the diet alone, and would not get optimal blood glucose targets. As a result, the patients evaluated in this study started the medical treatment very soon.

The median duration of oral antihyperglycemic agents therapy in the patients was 8 years, which was 5 years of single medicine and 3 years of multidrug. About 40% of the patients responded to the single drug therapy for 5 years, and 60% of them were directly treated with the multiple drug therapy or insulin. The failure of single drug therapy was caused by insulin resistance and the duration of diabetes.

The initial failure in the treatment by oral medication in patients with type 2 diabetes was 10% to 15% per year. [11] So, if type 2 diabetes patients had enough life, they would eventually need insulin therapy. In this study, insulin was started about 9 years after the diagnosis of diabetes. At the time of the onset of insulin, the mean fasting blood glucose and HbA1c were 185 mg⁄dl and 9.6% ; respectively. Depending on the results, it was clear that insulin should be started earlier for the patients, but unfortunately, the patients were resistant to insulin injections. The reason for the resistance of patients to insulin was the fear of it, and the feeling of failure in the treatment, and the people thought that they have reached the end of their life. The reasons for delays in administering insulin on type 2 diabetes patients may include the patients' resistance or the physicians' doubtfulness on how to make this transition. [11]

The United Kingdom Prospective Diabetes Study showed that strict glycemic control has similar benefits in patients with type 2 diabetes. [12] The economical analyses have suggested that diabetes screening in adults is cost-effective. As an example, in a computer simulation model, eight screening strategies were compared with a no-screening control strategy in a simulated population of 325,000 people aged 30 years without diabetes. [13] The early diagnosis by all screening strategies included advantages such as the decreased occurrence of myocardial infarction and microvascular problems, and the increase in quality-adjusted life years over 50 years of age. [14] The most cost-effective strategies were those that started between the ages of 30 and 45 years, with the repeated screening every three to five years. Although, it has not been established that **early** detection of type 2 diabetes and the intervention would improve the long-term outcomes. [15]

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Compliance with ethical standards

All the procedures carried out in this study on human participants were based on the ethical standards of the institutional and national research committee, and the 1964 Helsinki declaration, and its later amendments or comparable ethical standards.

Conflict of interest

The authors declared that they had no competing interests.

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