Factors influencing insulin usage among type 2 diabetes mellitus patients: A study in Turkish primary care

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Introduction

DM patients with poorly regulated blood glucose levels are at risk of increased morbidity and mortality.[1] In Turkey, management of diabetes mellitus is sub-optimal, principally because of misunderstanding and lack of knowledge relating to insulin therapy. According to recent estimates, half of the patients with type 2 diabetes mellitus (DM) require insulin in the first six years following diagnosis.[2–5] Many patients with type 2 DM must commence insulin therapy to reach the desired glycaemic values.[6] Insulin ensures attainment of recommended desired metabolic targets, maintains the blood glucose level at an appropriate range, and inhibits many complications resulting from hyperglycaemia. Different studies show the positive long-term benefits of intensive insulin therapy.[4,7,8] However, insulin is usually not taken on time by these patients.[9,10] The indifferent attitude of type 2 DM patients toward initiating insulin therapy resulted in an ongoing cycle of poor glycaemic control.
and augmented risk for neuropathic, micro- and macrovascular complications, and death.[11]

HbA1C reflects good glycaemic control and is one of the important targets for DM patients for reducing the risk of complications.[11,12] Although three anti-hyperglycaemic drugs can be taken in combination, for some patients, control of glucose continues to be poor. In chronic diabetes, the clinical profile is directed by an important decrease in pancreatic insulin secretory capacity. Most of those studies have indicated equal or slightly superior efficacy to the addition of prandial insulin with accompanying weight loss and decreasing hypoglycaemia.[13,14]

There are different factors that cause resistance to the initiation of insulin therapy such as beliefs and perceptions concerning diabetes and its treatment and the nature and consequences of insulin therapy.[15] This may also be due to a dislike of the healthcare centres.[16] There could also be many other factors that might influence attitudes, such as patient hesitation, prejudice against injection, misperceptions, inadequate knowledge of insulin action and belief that another treatment should be offered as the initial treatment.[17] Concerns that the patients may have include the efficiency and possible complications related to insulin use, injection anxiety and the fact that patients tend to consider insulin as a drug of last resort.[17,18] With improved education and a creation of realistic expectations, patients' concerns towards insulin therapy can be decreased at the time of intended therapy initiation.

DM patients who do not take insulin as recommended will consequently burden healthcare providers and national budgets because they will require hospitalization to treat their impending or long-standing complications of diabetes.

However, some patients can attain pre-planned diabetes control targets.[19] In our study, we planned to study patients' concerns related to their unwillingness to start insulin therapy, and we provide some guidelines for patients to encourage appropriate glycaemic control.

Methods

Study design

This cross-sectional, descriptive study evaluated patients with type 2 DM between 1 December 2013 and 1 June 2014. They were followed-up in the Departments of Family Health Care and Endocrinology for type 2 DM, where their glycaemic follow-up was conducted. The treatments, follow-ups, and medical care of patients who were diagnosed at the Family Health Care and Endocrinology Outpatient Clinic were performed by a team, including a specialist, diabetes nurse, and a dietician. Patients were informed about the disease and its complications. They were shown the appropriate treatment approach according to their characteristics; some changes in their lifestyle were suggested and their clinical follow-up was conducted at regular intervals. Every three months, the healthcare team members implemented educational seminars who informed ‘insulin-resistant patients’ about data and consequences of not using insulin when it is required.

Ethics

Ethics approval was granted by the Dicle University Clinical and Experimental Research Committee. The ethical committee met and approved the study on 11 November 2013 (approval no. 478).

Patients

Considering individual patient preferences, prognosis, and comorbidities, the patients for this study were chosen from those defined by the American Diabetes Association (ADA), the European Association for the Study of Diabetes (EASD) regarding who should be using insulin, in accordance with the Turkish Endocrine and Metabolic Associations (TEMD) criteria (Figure 1).[6,20,21]

Inclusion criteria

The patients included in the study were 18–65 years of age and used two or more oral anti-diabetic (OAD) combinations for at least six months. These OADs comprised a combination of metformin, DPP4 inhibitors, and sulfonylurea. Patients whose HbA1C was ≥7 at their six-month follow-up, and those who were prescribed insulin in clinical follow-up but avoided starting insulin were included.

Exclusion criteria

Patients who had a major surgery, cardiac valve replacement, transplantation, major abdominal surgery, any of the malabsorption syndromes or malabsorption, type 1 DM, psychiatric disease, depression, psychosis, advanced dementia, malignancy, high risk of hypoglycaemia, medical conditions wherein hypoglycaemia enhances mortality and morbidity, disability with low life expectancy, disability, history of dementia story,
and those who were bedridden were excluded from the study. Thus, 117 patients were selected, however only 94 agreed to participate in the survey.

**Interviews**

To ensure the quality of the information gathered from the patients, we conducted face-to-face interviews. Prior to the interviews with the patients, we had some mock patient encounters for the purpose of clarifying any patient perspective misunderstandings in the questions. All of the interviews were conducted by AY. Patient identities were not revealed to us. All patients gave written informed consent. The diagnoses and follow-up of our patients were performed with the consideration of the national TEMD algorithms (Figure 1).

**Survey form and data collection**

Two-step pre-coded questionnaires were used to gather data. The interviewers read out the questions
The early parts of both the questionnaires explored demographic variables. The remaining parts of the questionnaires featured on the perceived efficacy and health benefits of insulin; difficulties encountered/expected in insulin management; perceived potential side effects or complications; and professional, social, and religious constraints on insulin use. Information on age, sex, education status, marital status, localization, occupation was recorded (Table 1).

**Views of patients regarding insulin initiation**

The survey questions, which were thought to affect insulin use, are given in Table 2 and these questions can be categorized into three groups according to the learning objectives. Seven questions measured the knowledge level relating to insulin, three questions concerned the knowledge of insulin use. Finally, two questions reflected spiritual considerations about insulin.

### Statistical analysis

All data were analysed using SPSS for Windows, version 18 (Statistical Package for the Social Sciences, Chicago, IL, USA). A P-value of <.05 was considered statistically significant. The frequency distribution of the answers relating to insulin treatment was given. Pearson’s correlation test was used as applicable. Answers to three-point Likert-type scales were consolidated by combining ‘strongly agree’ with ‘agree’ and ‘strongly disagree’ with ‘disagree’. Frequency distributions were also calculated. Spearman rank correlation coefficients (P-values) were calculated to explore the relationships between educational level and the capacity to self-inject insulin. Intraclass correlations (ICC) refer to a family of analysis of variance approaches that express reliability as the ratio of variance between subjects to total variance in scores and range from –1 to +1.[22,23]

### Results

The average age of the 94 patients was 50.4 ± 11.4 years, and 57.4% were female and 87.2% were married. Among all patients, 75.5% lived in cities; 17% and 7.5% of patients lived in the country and villages, respectively. In terms of educational status, 29.8% of patients were illiterate and 26.6% had completed only primary school. The percentage of patients graduated from secondary school, high school, and university is...
were 12.8%, 14.9%, and 16%, respectively. While 13.8% of the patients had a history of hospitalization, 86.2% did not (Table 1). The BMI (body mass index) of the patients was measured and the average value was 30.4 ± 7.2.

The results indicated that Intraclass Correlation Coefficients (ICC) of the survey questions range was 0.61–0.82. The highest reliability was assigned to questions of insulin usually being prescribed as a last treatment option (ICC = 0.82), and the lowest reliability was assigned to where insulin led to weight gain (ICC = 0.61). This indicated that reproducibility was demonstrated in our questionnaire.

The results analysed by one-way ANOVA test revealed insulin self-injection capability was statistically significant between groups according to educational status (university graduates, high school graduates, primary school graduates and uneducated patients) (F = 4.66, P = .002). Then we applied Tukey’s honest significance test method for the comparison of these groups. Insulin self-injection capability was statistically significant higher in university graduates than primary school graduates and nil-educated patients (P = .01). As the patient’s age increased, knowledge of insulin treatment decreased (P = .046; r = −0.206). The idea that insulin was the last resort was more prevalent among patients with lower educational levels (primary school graduates and uneducated patients) (P = 0.037).

We found that almost half of the patients were unaware of the influence of insulin and the complications of DM. The number of patients who thought that insulin prevented the complications of DM exceeded those who thought the opposite, while more patients thought that insulin injection was painful and difficult. Many patients did not agree with the fact that insulin ameliorates the DM course. Those who believed the opposite were more concerned with maintaining insulin once they started the therapy, the need for an increase in dose, gaining weight, and having too low blood glucose level. Most patients stated that their religious beliefs did not restrict their insulin use and that their family health physicians sufficiently informed them about the usage of insulin. Moreover, most patients gave little consideration to not using insulin since there was nobody else who could administer the injection, in case it is required (Table 2).

Discussion

Main findings

Our patients were fundamentally unaware of the positive effects of insulin concerning mechanism of action, necessity, and avoidance of potential complications. Patients had inadequate information on how to respond the unwanted effects of insulin. Most patients lacked explicit and accurate information on the advantages and disadvantages of insulin. For instance, many of our patients believe that insulin lowers the blood glucose level too much. Inadequate and wrong information enhanced the reluctance to use insulin.

Strength and limitations

To our knowledge, this is the first article to study the attitudes of type 2 DM patients resisting recommended insulin therapy in our country. We sought to discover why. A possible limitation is that the study was conducted in only one centre, with a relatively small number of patients. In addition, we asked closed questions; patients were not invited to elaborate on other possible concerns.

The knowledge about insulin

The lack of adequate information and frequent misunderstandings contribute to an unwillingness to take insulin. If insulin is essential at any time, it is imperative to change such attitudes, especially in patients with a poor education. Such patients need to be educated on the progressive nature of diabetes, the role played by insulin, and the mechanism of insulin action.

The goal of education should be to overcome barriers to initiation of insulin therapy, and to tackle the reluctance to overcome such barriers, by providing a base of evidence supporting rational decision making. Educational tools should be presented in multiple formats to allow patients to choose materials with which they are comfortable. Continuing medical education programmes and commercial educational initiatives may prove useful. In this respect, we believe that primary care physicians, who play an indispensable role in the follow-up of DM patients, should provide adequate continuing education. As patient training is critical regarding DM follow-up and treatment, we believe that primary care physicians should provide guidance tailored to individual patient needs; multidisciplinary teams including nurses and specialists working in primary care clinics have successfully increased the initiation levels of insulin therapy. The DM patients of the cited study stated that they commenced insulin therapy because their physicians gave them confidence, and explained how insulin worked. Insulin acceptance studies have shown that DM patients who refused insulin lacked knowledge on
what insulin achieved.[24] It is common for DM patients to lack information on insulin, or to be misinformed when insulin is first recommended.[25] Most DM patients manage their disease poorly and do not understand the significance of their condition or the effects of treatment.[26]

**The knowledge about insulin usage**

Many of our DM patients did not understand the benefits of insulin, or how to use insulin effectively, highlighting the need to raise the consciousness of diabetics in our region. As reported earlier, since the patients believed that self-injection was too hard to do, they refrained from doing it.[17,27] However, in this study, the patients thought that insulin injection was painful but doing it was not that difficult and they did not need someone to do it.

The perception of insulin as the last resort intimidate patients, when insulin initiation is perceived as the final solution patients may show some degree of reluctance. They fear that insulin would affect their lives negatively.[28] In our community insulin is not usually started until diabetes complications occur. Patients’ fear could be appreciated from this respect. Patients also disliked the prospect of daily injections. Brunton et al., also found that patients considered insulin to be the drug of last resort, and were thus reluctant to commence treatment.[29] These thoughts were more prevalent in poorly educated patients.

**Spirituality aspects of insulin**

Religious beliefs among the different people and cultures are potential factors for rejection irrespective of the pros and cons of insulin initiation. Lee et al. suggested that patients were reluctant to use insulin because they thought it was a pig product, which is unacceptable in Muslim societies.[30] However, Ahmed et al. reported that patients did not consider that their religion prohibited insulin use.[16] Surprisingly, we found no relationship between religious beliefs and avoidance of insulin use. The region we conducted this study is known for strong Muslim religious belief. We believe that this is explained by effective patient—physician interaction, patient training, sustained follow-up, and the fact that primary care physicians gained patient confidence. In our study, most patients said that their physicians had convinced them that insulin therapy was necessary. Apparently, they had in fact been well informed; physicians had afforded adequate guidance.

Eliminating bias, overcoming personal obstacles, and engaging with primary care physicians, trained health professionals, and the first line of a healthcare system, is the modern mode of DM management. Early in such management, patients should be told that insulin may be required at any stage and they need to be educated on insulin use. Such education must explain the significance of insulin, create awareness, and eliminate misunderstandings. Such efforts should counter the obstacles we have described and eliminated the ‘resistance towards taking insulin’ observed in many patients, particularly in developing countries.

**Conclusion**

The perception that insulin is a last resort is a major barrier to acceptance of insulin treatment. Our most significant finding is that a lack of adequate information on insulin appears to be the principal reason why insulin treatment is refused by patients with type 2 DM. Religious beliefs, family physician attitude, difficulty in insulin injection, or the presence or absence of a family member to inject insulin, are not important barriers to insulin treatment. The need to explore patient attitude and behaviour is obvious and crucial for controlled studies, particularly in patients who have been recently prescribed insulin. This would yield further information on the decision-making process.

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The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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