Adherence to insulin therapy at a tertiary care diabetes center in South India

M.S. Raut, J. Balasubramanian, R.M. Anjana, R Unnikrishnan, *V. Mohan

Abstract

To assess patient adherence to insulin therapy and factors contributing to non-adherence at a tertiary care diabetes center in South India. Adherence to insulin therapy was assessed in 500 consecutive patients with type 2 diabetes on insulin for at least 3 months, using a 30 point questionnaire – Questionnaire for the Use of Insulin in Diabetes (QUID). Non-adherence was defined as deliberate omission of insulin by the patients at least once a week. Severity of hypoglycemia and reasons for non-adherence and patient attitudes towards insulin therapy were also assessed. Only 28(5.6%) out of 500 patients did not adhere to insulin therapy. Of the 472 patients who adhered to insulin, 416 (88.1%) patients were regular insulin users. The cost of insulin was reported as a major issue by 411 (87%) out of the 472 patients who were adherent to insulin, 61 (12.9%) felt uncomfortable with the injections, 50 (10.6%) felt that it affected their routine activities and 16 (3.4%) reported that it worsened their quality of life (QOL). Hypoglycemia was experienced by 264 (55.9%) patients, and severe hypoglycemia by 21 (4.4%) patients. However, 429 (90.9%) patients reported improved QOL after taking insulin and 434 (91.9%) stated that they would recommend insulin to other patients. Adherence rates to insulin are high in this tertiary diabetes care center in South India. Cost of insulin and hypoglycemia could be the primary factors contributing to insulin non-adherence in our setting.

Key words: Adherence, diabetes, insulin therapy, cost of insulin, hypoglycemia, quality of life

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Introduction

One of the challenges in the efficacious implementation of quality healthcare is the lack of patient adherence to medical recommendations (1). Efficacy of the treatment and its outcomes are heavily influenced by medication adherence. Often, patients cut down their medications, or do not take them at all, because of cost or other reasons. The consequences of this could make an easily controllable medical condition snowball into a major medical emergency requiring hospitalization (2). It is estimated that adherence to prescribed medications in chronic lifelong diseases, including diabetes is poor.

In all forms of diabetes, insulin therapy remains one of the most effective treatment options (3). However, despite the recognized importance of optimal insulin therapy, patient adherence to insulin therapy remains a major challenge. Omission of insulin continues to be frequent and underestimated and this has been correlated with poorer glycemic control and possible increased rates of diabetes related complications. Insulin users identify multiple factors that contribute to insulin injection related anxiety and thus to non-adherence (4).

Surprisingly, there are no studies on insulin adherence rates in India. The aim of this study was to look at adherence rates to insulin at a tertiary care diabetes center in South India and analyse the reasons for non-adherence.

Methodology

The study was carried out at Dr. Mohan’s Diabetes Specialities Centre (DMDSC), a large tertiary care center for diabetes at Chennai in South India. A 30 point questionnaire called
QUID (Questionnaire for the Use of Insulin in Diabetics) was specifically prepared for the study taking into consideration various factors that a patient with diabetes on insulin would face, including comfort, cost, hypoglycaemia, quality of life etc. and these factors were analyzed with respect to insulin adherence. Five hundred consecutive patients with type 2 diabetes attending the center in the year 2012 who had been on insulin therapy for more than 3 months were included in the study.

The questionnaire was administered by a physician (MSR). Non-adherence was defined as deliberate omission of insulin by patients at least once a week. Regular insulin users were defined as those who said that they did not miss a single dose of insulin even once a week. Improvement in glycemic control was evaluated using glycated hemoglobin (HbA1c) at the time of starting insulin and at the next follow up visit. HbA1c was estimated by high pressure liquid chromatography using a Variant machine (Bio-Rad, Hercules, CA). The intra and inter-assay coefficient of variation of HbA1c was less than 5%. The quality of life (QOL) questionnaire was based on socio demographic and clinical history and modified from WHOQOL-BREF (WHO 1996) by modifying Likert scale (5). The improvement or worsening was based on a Likert scale from 1 to 10 and if it changed by at least 2 points on the Likert scale, this was considered significant.

Severity of hypoglycemia was classified as follows (6):
- Mild: Autonomic mediated symptoms, able to treat self.
- Moderate: Autonomic and neuroglycopenic mediated symptoms. Able to treat self.
- Severe: Unable to treat self. Requires assistance. May be unconscious. Plasma glucose usually < 2.8 mmol/l (50 mg/dl).

Institutional Ethics Committee (IEC) approval was obtained prior to the start of the study and written informed consent was obtained from the patients.

Statistical analysis
Data was expressed as mean ± standard deviation (SD). The Student t-test or chi square test was used to compare groups for continuous and categorical variables respectively. All analysis was done using Windows based Statistical Package for Social Sciences (SPSS) Version 10.0. P ≤ 0.05 was considered as statistically significant.

Results
A total of 500 patients with type 2 diabetes participated in the study. Table 1 shows the baseline characteristics of the study subjects. The mean age was 58 ± 15.4 years, male:female ratio was 57:43, mean duration of diabetes was 15.3 ± 8.2 years, body mass index (BMI) 25.3± 5.2 kg/m2, systolic blood pressure 132 ± 20 mmHg, diastolic blood pressure 81 ± 9 mmHg, HbA1c 9.8 ± 2.3%, fasting blood sugar (FBS) 200 ± 81 mg/dl, Post prandial blood sugar (PPBS) 294 ± 104 mg/dl, serum cholesterol 186 ± 54 mg/dl, serum triglycerides 153 ± 11 mg/dl and high density lipoprotein cholesterol 40 ± 11 mg/dl.

Overall, 472 (94.4%) patients adhered to their insulin regimen (Table 2). Thus, only 28 (5.6%) patients were found to be non-adherent to insulin. Of those who were non-adherent, 16 (58%) missed their doses once or twice a week, 6 (21%) patients stopped the noon dose and the remaining 6 patients stopped insulin completely. Four hundred and sixteen (83.2%) patients out of 500 were regularly using insulin. However, majority of the patients [472 (87%)] who adhered to insulin felt that cost was definitely an issue. Weight gain was reported by 425 patients and this led to discontinuation of insulin in four patients. Mean weight of patients before and after starting insulin were 66.1 ± 16.2 kg and 69.1 ± 17.4 kg respectively (p < 0.001). Sixty one (12.9%) patients were uncomfortable with the use of insulin. Fifty (10.6%) patients felt that taking insulin curtailed their routine activities while 16 (3.4%) patients experienced worsening of quality of life (QOL).

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However, it was gratifying that 429 (90.9%) patients out of 472 experienced improvements in QOL after starting insulin and 434 (91.9%) patients felt that insulin was beneficial and hence they would recommend it to other patients with diabetes.

The mean HbA1c of the patients during the last visit decreased from 9.8 ± 2.3 at baseline to
8.2 ± 1.6% which indicated a significant improvement after starting insulin.

Hypoglycemia was experienced by 264 (55.9%) out of 472 patients which included 166 with mild, 70 with moderate and 21 with severe hypoglycemia. Four hundred and fifteen (87.9%) patients stated that they had improvement in diabetes control after initiation of insulin.

**Table 1 : Baseline characteristics of the patients with type 2 diabetes (n = 500)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>58 ± 15.4</td>
</tr>
<tr>
<td>Male : Female</td>
<td>57 : 43</td>
</tr>
<tr>
<td>Mean duration of diabetes (years)</td>
<td>15.3 ± 8.2</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>25.3 ± 5.2</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>132 ± 20</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>81 ± 9</td>
</tr>
<tr>
<td>HbA1c (%)</td>
<td>9.8 ± 2.3</td>
</tr>
<tr>
<td>Fasting blood sugar (mg/dl)</td>
<td>200 ± 81</td>
</tr>
<tr>
<td>Postprandial blood sugar (mg/dl)</td>
<td>294 ± 104</td>
</tr>
<tr>
<td>Serum cholesterol (mg/dl)</td>
<td>186 ± 54</td>
</tr>
<tr>
<td>Serum triglycerides (mg/dl)</td>
<td>153 ± 11</td>
</tr>
<tr>
<td>High density lipoprotein cholesterol (mg/dl)</td>
<td>40 ± 11</td>
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</tbody>
</table>

* Data presented as geometric Mean + SE

**Discussion**

Our study shows that the majority of patients who were prescribed insulin at this tertiary care diabetes center in South India were adherent to insulin therapy. The possible reasons for the higher adherence found in our patients could be the intensive education about diabetes and the beneficial effects of insulin and the constant motivation provided by the team of diabetes educators at the center.

**Table 2 : Adherence and non-adherence to insulin therapy (n = 500)**

<table>
<thead>
<tr>
<th>Adherence / non-adherence to insulin therapy</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adherent</td>
<td>472 (94.4%)</td>
</tr>
<tr>
<td>Non-adherent</td>
<td>28 (5.6%)</td>
</tr>
</tbody>
</table>

**Quality of life**

| Improved                                      | 429 (90.9%) |
| Deteriorated                                  | 71 (9.1%)   |

**Hypoglycemia**

| Mild                                          | 155 (32.8%) |
| Moderate                                      | 70 (14.8%)  |
| Severe                                        | 21 (4.4%)   |

**Issues associated with the use of insulin**

| Cost of insulin                              | 411 (87%)    |
| Felt uncomfortable with the injections       | 61 (12.9%)   |
| Affected their routine activity              | 50 (10.6%)   |
| Worsened their quality of life               | 16 (3.4%)    |

* Data presented as n (%) (n=472)

Working with patients to enhance treatment adherence helps to strengthen and maintain a collaborative patient–provider relationship. Patients who are satisfied with their service provider are more likely to return for follow-up and also to adhere to medications (7).

It is also gratifying that the majority of the patients were comfortable with the use of insulin in the study. The reason could be the positive attitude of the patients towards their disease and awareness about complications, thanks to the education received by the patients during their follow up visits (8).

Also, since the patients seen at this private center belong mainly to the higher socioeconomic class, the cost of insulin which is a significant barrier in the general population may not be as significant here. However, even at our center, most patients did feel that cost was an issue and that if insulin price was lower, it would benefit everyone. Wagner et al., (9) and Peyrot et al., (10) showed that practical issues like medication costs may prevent the patient from adhering to therapy. This is particularly the case in low and middle income
countries like India. There is definitely a strong case for provision of good quality insulin at low cost in these countries to improve adherence.

A few patients discontinued insulin therapy for various reasons like frequent low blood sugar reactions, advice from physicians elsewhere, trial of alternative medicines, needle phobia and other causes. Most patients experienced weight gain after the use of insulin but it was one of the causes of stopping insulin in only 4 cases. About 50 (10%) patients felt that taking insulin restricted their routine activities, and a small number (3.4%) felt worsening of disease after starting insulin. This could be, because in the initial stage of starting insulin, neuropathy and / or retinopathy may transiently worsen.

Most of these concerns can be addressed by proper patient selection, administration of the correct drug regimen and patient education. Use of thinner injection needles, insulin pens and where indicated, insulin pumps can ameliorate the pain associated with insulin injection. Use of insulin analogues allows for greater flexibility in lifestyle and minimizes the risk of hypoglycemia. Concomitant use of insulin sensitizers (metformin) and newer agents like glucagon-like peptide 1 (GLP-1) analogues and adherence to diet and physical activity could help minimize weight gain due to insulin.

The mean HbA1c of the patients decreased from 9.8 ± 2.3% at baseline to 8.2 ± 1.6% during the last visit. While this was a significant improvement after starting insulin, it showed that the control was still inadequate. This may be attributed to either under insulinization or the fact that patients may be under reporting, missing their doses of insulin. Only well planned longitudinal studies can throw more light on this and such studies are urgently needed in developing countries.

Patients also have many mistaken beliefs about insulin. Many feel that insulin therapy is a ‘punishment’ meted out to them for not taking good care of themselves. Others fear that initiation of insulin therapy indicates the onset of the terminal stage of the disease. Physicians in many cases, feel ill-equipped to identify these concerns of the patient or help the patient deal with such distress (7). Indeed, many of these misconceptions are also shared by physicians. Education regarding the progressive nature of type 2 diabetes and the benefits of insulin should be provided to patients right from the time of diagnosis of diabetes. This will help reduce psychological barriers when the time for insulin initiation eventually arrives.

One of the strengths of this study is that it is one of the first from India that systematically reviewed factors influencing adherence to insulin therapy and the reasons for non-adherence in patients with type 2 diabetes.

One of the limitations of the study was that the higher rates of adherence found in this study cannot be extrapolated to primary care centers because the level of care and education given in a tertiary care diabetes center is definitely higher than the primary care centers. Obviously, such data from government institutions, smaller centers and remote areas are urgently needed. Hence the findings of this study are not generalizable to the whole of India. There could be weaknesses and inherent biases in self-reported results particularly when the treating physician administers the questionnaire to patients. It is to be expected that there would be some degree of under reporting.  This is another limitation of the study.

In summary, our study clearly indicates that the adherence rate to insulin therapy is high in patients attending a tertiary care diabetes center in South India. However, similar data is needed from other centers as well before any generalization of the data can be made. All efforts must be made to improve adherence rates to medications in general and insulin in particular in order to prevent the micro and macro vascular complications of diabetes.

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Conflict of Interest

The authors report no relevant conflict of interest.

References


