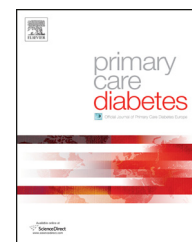




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## Original research

# Insulin adherence in patients with diabetes: Risk factors for injection omission



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## ABSTRACT

**Aims:** The purpose of this study was to evaluate adherence to insulin therapy in patients with diabetes. The underlying factors affecting insulin injection omission among patients with type 1 or 2 diabetes were also investigated.

**Methods:** This cross-sectional study has been conducted on 507 patients with diabetes. Adherence to insulin therapy was measured by the 8-Item Morisky Medication Adherence Scale (MMS) and the autocompliance method. Furthermore, socio-demographic, disease and injection-related barriers to insulin injection were assessed.

**Results:** Based on the Morisky Green test, 14.3% and 28.8% of patients with type 1 and 2 diabetes respectively had low adherence to insulin therapy. However, almost all patients were adherent according to the autocompliance method. Different factors showed a significant association with insulin compliance in both groups.

**Conclusions:** The current study suggests acceptable adherence to insulin therapy among patients with type 1, and poor adherence in patients with type 2, diabetes. Our findings regarding barriers with significant effect on insulin adherence may be useful to identify patients at risk for low compliance, and to guide the design of proper strategies to improve adherence and the consequential clinical outcomes.

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## 1. Introduction

The increasing number of patients with diabetes is costly and has a large economic burden on society, so the care and management of patients with insulin treatment has seen a rapid evolution, contributing to improved metabolic control and delayed progression of microvascular complications in these patients [1–4]. Also, clinical outcomes support benefits associated with early initiation and intensification of insulin therapy in patients with type 2 diabetes [5].

However, medications are effective only when they have been taken according to the recommendations of health care providers and unfortunately poor adherence among patients with diabetes remains a common problem [6,7].

The centers for disease control and prevention (CDC) estimates that more than 25% of patients with diabetes take insulin. In spite of the crucial role of adherence to insulin for achieving therapeutic goals, few studies have evaluated adherence to insulin and its associated factors.

In a study using an internet survey of 502 U.S. adults with type 1 or type 2 diabetes, more than half of them reported intentional insulin omission [8]. Another study revealed that 77% of the prescribed insulin dose was taken by patients [9]. A systematic review in 2004 disclosed that only one-third of the prescribed insulin dose was used by young patients and estimated adherence was 62–64% among patients with type 2 diabetes.

Low insulin adherence reported in previous studies may be the culprit for the unstable and generally poor glycemic control [10]. Therefore, identification of the underlying factors which predispose patients to poor adherence is necessary for better glycemic control.

Several studies have been conducted to detect factors associated with insulin adherence, but there is lack of evidence regarding the influence of these factors on adherence to insulin [8,11,12]. In addition there is scarce information about the rate of poor adherence to insulin therapy and related risk factors in developing countries which play a fundamental role in achievement and maintenance of adequate glycemic control [11,13,14].

Therefore, the present study was designed to evaluate adherence to insulin therapy in patients with diabetes. The secondary goal of the study was to investigate the underlying factors that may predispose patients to low insulin adherence.

## 2. Methods

In this cross-sectional study 507 patient with type 1 ( $n=251$ ) or type 2 ( $n=256$ ) diabetes were selected using the convenience sampling method from Endocrinology and Metabolism Research Center (EMRC) outpatient diabetes clinic, affiliated to Tehran University of Medical Sciences (TUMS).

Participants had to be on a stable dose of insulin prior to the study and willing to participate in the study. Patients who had cognitive impairment or a severe health condition, who could not participate in the study, were excluded.

A questionnaire was designed to collect information about socio-demographic characteristics (age, sex, BMI, level of

education), type and duration of diabetes and insulin injection, adherence to insulin and barriers to patient compliance.

Adherence to insulin was measured by the 8-Item Morisky Medication Adherence Scale (MMAS) reported by Sakthong et al. According to 8-Item MMAS, a patient was considered a low adherent if s/he received scores of less than 6.0, while scores between 6.0 to <8.0 and 8.0 were categorized as medium and high adherence respectively [1].

Furthermore, compliance with insulin was also measured by the autocompliance method. The autocompliance test estimates the number of skipped insulin injections during the previous month, following the methodology of Haynes et al. [15]. It measures according to patient self reporting of difficulty in taking the medication by asking two open questions: (1) “Did you have any difficulties in insulin injection?” and (2) “How many times did you skip insulin injection in the last month?”

Autocompliance was calculated by using the following formula:

$$\frac{\text{Total number of insulin injections}}{\text{Total number of prescribed insulin injection}} \times 100$$

Patients who affirmed taking more than 80% of the total number of prescribed insulin injections were considered as compliers with insulin [16].

Barriers to insulin injection were assessed in the last section of the questionnaire which covered patient and medication factors.

Validity and reliability of the questionnaire was determined in a pilot study.

A pharmacist assessed adherence to insulin and its associated factors via telephone interview, using the final questionnaire.

The TUMS ethic committee approved the study protocol and verbal informed consent was obtained from participants prior to the interview.

### 2.1. Statistical analysis

The distribution of continuous variables was assessed by the Kolmogorov–Smirnov test. Continuous variables are expressed as mean  $\pm$  SD and categorical data are expressed as a percentage. The chi square test was used to analyze categorical data. The association between level of adherence and continuous variables was assessed by independent sample T-test for parametric variables and Mann–Whitney U-test for non-parametric variables. A P-value less than 0.05 was considered as statistically significant. Analysis was done with SPSS version 11.5 software.

## 3. Results

Almost half of the studied population (49.4%,  $n=251$ ) were patients with type 1 diabetes. Demographic variables and diabetes characteristics of the participants are shown in Table 1.

Cronbach’s alpha coefficient was 0.82, confirming the reliability of the questionnaire.

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