# Factors associated with glycemic control in insulin-treated patients with type 2 diabetes


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## Background

Early initial insulin treatment is frequently recommended for patients with type 2 diabetes (T2DM) but with poor glycemic control. Nevertheless, many studies have also found that even patients with T2DM transferred to receive insulin treatment, they did not achieve optimal glycemic control.

## Purpose

To explore the associated factors of glycemic control in patients with T2DM and received insulin treatment.

## Methods

Overall, 255 patients with T2DM who have been diagnosis with T2DM more than 6 months and received insulin treatment more than 3 months were recruited from 2 hospitals by convenience sampling in Taiwan. A self-reported questionnaire was used to collect demographic data (gender and age), disease characteristics (duration of diabetes, duration of insulin injection, combining oral therapy, and body mass index), treatment factors (adherence rate of frequency and dose of insulin injection, adherence rate of blood sugar monitoring) and psychosocial factors (decisional balance of insulin injection, health, literacy, empowerment perception, self-efficacy of insulin injection, and diabetes distress). The latest HbA1c levels before receiving insulin injection and the first HbA1c levels after administering questionnaire was collected from medical record of each participant.

## Result

1. The mean of HbA1c levels was 8.35 ± 1.48. Only 16.2% ( n=42) of participants had their HbA1c levels smaller than 7%.
2. Distribution of demographic and disease characteristics as well as regimen adherence of participants (Table 1).
3. Body mass index, the last HbA1c levels before insulin injection, frequency of insulin injection, empowerment perception, and diabetes distress were important determinants of HbA1c levels (Table 2).

**Table 1. Distribution of demographic and disease characteristics as well as regimen adherence of participants (N=255)**

| | n (%)/mean ± SD |
|---|---|
| Demographic and disease characteristics | |
| Sex | |
| Male | 158 (62.0) |
| Female | 97 (38.0) |
| Age (yrs) | 56.58 ± 10.92 |
| range：25-87 | |
| Combining oral medication | |
| Yes | 186 (72.9) |
| No | 69 (27.1) |
| Body mass index | 26.90 ± 4.46 |
| range：16.89-44.79 | |
| Duration of diabetes (years) | 13.37 ± 8.11 |
| range：13.41-8.07 | |
| Duration of insulin injection (years) | 5.44 ± 4.57 |
| range：3-360 | |
| The last HbA1c levels before insulin injection | 10.39 ± 2.09 |
| range：5.80-17.50 | |
| The latest HbA1c levels | 8.35 ± 1.48 |
| range：5.40-13.00 | |
| Regimen adherence factors | |
| Frequency | |
| Incomplete | 26 (10.2) |
| Complete | 229 (89.8) |
| Dose | |
| Incomplete | 39 (15.3) |
| Complete | 216 (84.7) |
| Blood sugar monitoring | |
| Incomplete | 127 (49.8) |
| Complete | 128 (50.2) |

**Table 2. Correlation and hierarchical multiple regression for associations of demographic and disease characteristics, regimen adherence factors, and psychosocial factors with HbA1c levels (N=255)**

| | | Model 1 | Model 2 | Model 3 |
|---|---|---|---|---|
| | *r* value | β | β | β |
| Demographic and disease characteristics | | | | |
| Sex [a] | -0.065 | -0.066 | -0.073 | -0.079 |
| Age | -0.066 | -0.060 | -0.055 | -0.040 |
| Duration of diabetes | 0.021 | 0.101 | 0.102 | 0.106 |
| Duration of inulin injection | 0.008 | -0.035 | -0.051 | -0.035 |
| BMI | 0.119* | 0.136* | 0.128 | 0.129* |
| Combining oral medication [b] | 0.058 | 0.074 | 0.070 | 0.082 |
| The last HbA1c levels before insulin injection | 0.272*** | 0.286*** | 0.286*** | 0.285*** |
| Regimen adherence factors [c] | | | | |
| Frequency | -0.062 | | -0.095 | -0.133* |
| Dose | -0.057 | | -0.018 | -0.023 |
| Blood sugar monitoring | -0.120 | | -0.038 | 0.048 |
| Psychosocial factors | | | | |
| Empowerment perception | -0.198** | | | -0.157* |
| Decisional balance for insulin injection | -0.172** | | | -0.078 |
| Health literacy | -0.130* | | | -0.090 |
| Self-efficacy for insulin injection | -0.074 | | | 0.040 |
| Diabetes distress | 0.144* | | | 0.156* |
| Adjusted $R^2$ | | 0.083 | 0.084 | 0.153 |
| Change in *F* | | 4.301*** | 1.067 | 4.341*** |

Note. [a]: female as reference, [b]:no oral medication as reference, [c]: incomplete as reference, β: standardized beta coefficient, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

## Conclusions

Adherence of frequency of insulin injection was more important than adherence of dose of insulin injection and blood sugar monitoring to associate with HbA1c levels. Beside treatment factors, healthcare providers need to care for the psychosocial factors of patients with T2DM and receive insulin treatment. Empowerment care and reducing diabetes distress may benefit the glycemic control in patients with T2 DM diabetes insulin-treated.

## References


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