Association between the Medication Adherence and Treatment Satisfaction among Patients with Type 2 Diabetes in Guangdong Province, China

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Abstract—Objective: To analyze the association between medication adherence and treatment satisfaction of the patients with type 2 diabetes at community health service center in China. Methods: 4,560 community T2DM patients were selected by cross-sectional study. We collected the patients’ data including the socio-demographic, medication knowledge, medication adherence and treatment satisfaction of T2DM. Results: Among the 4,560 T2DM patients, less a half of patients had good medication adherence. The satisfaction scores in the Effectiveness(62.3 ± 7.1), Side Effects(81.1 ± 10.5), Conveniences(63.7 ± 10.7), and Global Satisfaction domains(70.3 ±6.7) were low. There are positive correlation between adherence and overall treatment satisfaction score. We found that the main impact factors of medication adherence to antidiabetic therapy including educational level, income, duration of DM, pattern of antidiabetic treatment, presence of complication, number of medications, treatment satisfaction using logistic regression analysis. Conclusions: The T2DM patients’ medication adherence and treatment satisfaction at community health service center of China are not good. Low satisfaction is an important factor to disease the community type 2 diabetes patients’ medication adherence.

Keywords—diabetes mellitus; satisfaction; medication adherence

I. INTRODUCTION

Diabetes is a worldwide chronic disease with high blood glucose level for a prolonged time and with high morbidity and mortality1. Most European countries have formulated evidence-based guidelines to control those chronic diseases2,3. However, the effect is unsatisfactory4,5. Medications adherence (MA) is an important aspect of health care quality. Adherence is the obedience of the patient to the doctor’s advice6. However, medication nonadherence is common among type 2 diabetes (T2DM) patients7 which lead to poor prognosis and higher costs to the health care system8,9. Studies showed that the treatment satisfaction(TS) deeply affect the patient’s decision making of health10. Low treatment satisfaction was reported in chronic diseases patients China. Over one-half of chronic illness patients has been found to end up medication-related decisions even they did have medical advice10,11. Currently, there were many some studies about the assessment of adherence and treatment satisfaction, but only limited studies to research on the association between drug adherence and satisfaction of T2DM patients treated in primary care12,13,14,15.

A community health care services network has been built by China since 1997. The General practitioner was hoped to train as “gate-keeper” for primary care16. However, the management effect of diabetes mellitus in community health care services network is not satisfactory. In this study, we investigated the status of MA and TS, and analyze the association between MA and TS among the type 2 diabetes patients at community health service center(CHSC) of Guangdong province, China.

II. METHODS

A. Participants

22 CHSCs in Guangdong Province, China were selected from July to October in 2018. No less than 200 diabetes mellitus patients were selected in each CHSC survey and the total number of patients enrolled in this study was 4560. All respondents were type 2 diabetics patients who had been in community hospitals for more than one year. All patients were aged 20 years and over, were diagnosed with T2DM at least one year. They were treated for diabetes mellitus by anti-diabetes medications. All of the patients selected in this study were given verbal consent, and the personal information involved in the study was not opened.

B. Data Collection

A questionnaires was designed and used to collect the patients’ data. The questionnaire included: socio-demographic data, clinical related data, medical knowledge, medication adherence and treatment satisfaction.

C. Medication Knowledge

All the patients were assessed the medication knowledge by a medication knowledge questionnaire, which concluded five specific items. Each correct answer in the questions was score of “1,” and “5” is the total score.

D. Medication Adherence

We used a validated questionnaire (MCQ)17 to measure
the patients’ medication adherence. The MCQ was developed from Morisky self-reporting scale18. The total score of MCQ form 27 items means adherence, which was the evaluation criterion of medication adherence for each patient in this study. The scores may range from 7 to 2818, 19, 20.

E. Treatment Satisfaction

The Treatment Satisfaction Questionnaire for Medication (TSQM 1.4) (China version) was used to measure the patients’ TS in this study. The scores range from 0 to 100 in TSQM1.4,21,22.

F. Data collection Procedure

All the patients in this study, were 4,560 patients, response rate of 98.7% by face-to-face interviews. Quality control was carried out before data analysis.

G. Statistical Analysis

SPSS 19.0 software (Version19.0) was used in our statistical analysis. t test or analysis, chi-square test, person correlative analysis, and multiple logistic regression model was used in our study.

III. RESULTS

A. Participants’ Characteristics

4,560 T2DM patients (2,389 women and 2,171 men) were 4000 completed the all questionnaires. They were 62.3±8.7 years old (21 to 84 years old). The patients’ education levels is not high, one third among them only had primary and below education level.

The average disease duration of theT2DM patients is 5–27 years. More than one third patients was obesity. There were 3.9 medications should be eaten by the patients. All the baseline data were showed in Table 1.

| Variables                  | Sample       | Variables                  | Sample       |
|---------------------------|--------------|----------------------------|--------------|
| Age[SD]                   | 62.3±8.7     | Duration of DM (years) -n(%)| 1984(43.5)   |
| sex -n(%)                 | 2171(47.6)   | ≤5                         | 1632(35.8)   |
| female                    | 2389(52.4)   | 5-10                       | 944(20.7)    |
| Education level -n(%)     |              | >10                        |              |
| Illiteracy and semi -illiteracy | 433(9.5) | ≤25.0                      | 1341(29.4)   |
| Primary                   | 1113(24.4)   | 25.0-29.9                  | 1578(34.6)   |
| Secondary                 | 2212(48.5)   | >30.0                      | 1641(36.0)   |
| University                | 802(17.6)    |                            |              |
| Marital status -n(%)      |              | Pattern of antidiabetic treatment-n(%) | 3803(83.4)   |
| Unmarried                 | 137(3.7)     | OHA                        | 757(16.6)    |
| married                   | 3588(85.1)   | Insulin+/- OHA             |              |
| Divorced                  | 237(5.2)     | Presence of complication-n(%) | 1970(43.2)   |
| Widowed                   | 274(6.0)     | Yes                        | 2590(56.8)   |
| Income ¥/month -n(%)      |              | Total number of medication-n(%) | 315(6.9)     |
| Less than ¥ 2000          | 1259(27.6)   | 1                          | 1195(26.2)   |
| 2000-4000 ¥               | 1951(42.8)   | 2                          | 1829(40.1)   |
| More than ¥ 4000          | 1350(29.6)   | 3                          | 1221(26.8)   |
|                           |              | >3                         |              |

B. Medication Adherence

The MCQ score was presented in Tables 2 and 3. There were 2595 (56.9%) patients were non adherent. Forgetting to take medication was the main reason, while 26.5% of patients’ s knowledge score is more than 80%(Table 4), which demonstrates that most diabetic patients had a incorrect usage of the medication.

There were significant difference in medication adherence score at different educational level, income, marital status, presence of complication, duration of T2DM, antidiabetic treatment, medications number (p<0.05). High educational level patients had better medication adherence. The MA score in this study increased with the income level. MA score decreased with the BMI, and medications number. The patients receiving insulin therapy had lower medication adherence score(p<0.05).

| Questions          | Mean ± SD | Questions | Mean ± SD |
|--------------------|-----------|-----------|-----------|
| Questions1         | 3.03 ± 0.53 | Questions5| 3.62 ± 0.39 |
| Questions2         | 3.29 ± 0.62 | Questions6| 3.68 ± 0.36 |
| Questions3         | 3.48 ± 0.41 | Questions7| 3.58 ± 0.42 |
| Questions4         | 3.42 ± 0.61 | Mean total score | 24.10 ± 2.53 |
C. The Relationship between the TS and MA

Positive correlation was found between the global satisfaction and different domains: Side Effects, Effectiveness. As Fig.1A showed the patients with good medication adherence had higher satisfaction scores than that of nonadherence patients. ($p<0.001$).

The patients with complication had lower global TS scores comparing with those without complication(Fig.1B). Positive correlation was found between them.

### TABLE III. T2DM PATIENTS’ MCQ SCORE AND MA STATUS(N = 4,560)

| Total score(28 points) | N   | %  |
|------------------------|-----|----|
| 28 (100%)              | 898 | 19.7|
| 27 ( > 95%)            | 1067| 23.4|
| 23–26 (80%–95%)        | 1810| 39.7|
| 18–22 (60%–80%)        | 752 | 16.5|
| 18 ( < 60%)            | 33  | 0.7 |

**Note:** Nonadherence:26 and below; adherence:27 and higher.

### TABLE IV. THE ASSOCIATED WITH ADHERENCE AND NONADHERENCE AMONG T2DM PATIENTS

| Characteristic               | Nonadherent n (%) | Adherent n (%) | $\chi^2$-value | P-value |
|------------------------------|-------------------|---------------|----------------|---------|
| **sex -n(%)**                |                   |               |                |         |
| male                         | 1211(55.8)        | 960(44.2)     | 2.147          | 0.143   |
| female                       | 1384(57.9)        | 1005(42.1)    |                |         |
| **Education level -n(%)**    |                   |               |                |         |
| Illiteracy and semi- illiteracy | 278(64.3)     | 155(35.7)     | 27.014         | 0.000   |
| Primary                      | 682(61.3)         | 431(38.7)     |                |         |
| Secondary                    | 1206(54.5)        | 1006(45.5)    |                |         |
| University                   | 429(53.5)         | 373(46.5)     |                |         |
| **Marital status -n(%)**     |                   |               |                |         |
| Unmarried                    | 77(35.7)          | 60(43.5)      | 33.965         | 0.000   |
| married                      | 2177(38.7)        | 1703(43.9)    |                |         |
| Divorced                     | 138(54.5)         | 1006(45.5)    |                |         |
| Widowed                      | 203(54.5)         | 71(25.9)      |                |         |
| **Income £/month -n(%)**     |                   |               |                |         |
| Less than £2000              | 791(62.8)         | 468(37.2)     | 37.516         | 0.000   |
| 2000-4000£                   | 1116(57.2)        | 835(42.8)     |                |         |
| More than £4000              | 688(50.9)         | 662(49.1)     |                |         |
| **Body mass index, kg/m² -n(%)** |           |               | 1.017          | 0.602   |
| < 25.0                       | 748(55.8)         | 593(44.2)     |                |         |
| 25.0-29.9                    | 903(57.2)         | 675(42.8)     |                |         |
| > 30.0                       | 944(57.5)         | 697(42.5)     |                |         |
| **Duration of DM (years) -n(%)** |           |               | 133.785        | 0.000   |
| < 5                          | 982(49.5)         | 1002(50.5)    |                |         |
| 5-10                         | 932(57.1)         | 700(42.9)     |                |         |
| > 10                         | 681(72.1)         | 263(27.9)     |                |         |
| **Medication knowledge score(%)** |           |               | 84.203         | 0.000   |
| < 60                         | 1104(65.2)        | 589(34.8)     |                |         |
| 60-80                        | 901(54.3)         | 758(45.7)     |                |         |
| > 80                         | 590(48.8)         | 618(51.2)     |                |         |
| **Presence of complication-n(%)** |           |               | 67.360         | 0.000   |
| Yes                          | 1082(64.8)        | 587(35.2)     |                |         |
| No                           | 1513(52.3)        | 1378(47.7)    |                |         |
| **Pattern of antidiabetic treatment-n(%)** |         |               | 127.344        | 0.000   |
| OHA                          | 1867(52.5)        | 1689(47.5)    |                |         |
| Insulin+/− OHA               | 727(72.5)         | 276(27.5)     |                |         |
| **Number of medications -n(%)** |           |               | 9.837          | 0.020   |
| 1                            | 166(52.6)         | 149(47.4)     |                |         |
| 2                            | 650(54.4)         | 545(45.6)     |                |         |
| 3                            | 1048(57.3)        | 781(42.7)     |                |         |
| > 3                          | 731(59.9)         | 490(40.1)     |                |         |
D. Logistic Regression for Factors Predicting Medication Adherence in T2DM Patients

There were 10 factors (age, sex, education level, income, BMI, etc.) affecting medication adherence were analyzed by multiple logistic regression, finally. There were 7 factors (education, income, duration of DM, pattern of antidiabetic treatment, presence of complication, number of medications, global treatment satisfaction) were identified (Table 5).

TABLE V. MULTIPLE LOGISTIC REGRESSION ANALYSIS OF MEDICATION ADHERENCE

| Items                                | B     | S.E.  | Wald    | P      | OR    | (95%C.I for OR) |
|--------------------------------------|-------|-------|---------|--------|-------|-----------------|
| Duration of DM                       | -0.841| 0.094 | 71.621  | 0.000  | 0.473 | 0.324-0.614     |
| Number of medications                | -0.459| 0.082 | 30.568  | 0.000  | 0.628 | 0.531-0.741     |
| Pattern of antidiabetic treatment    | -0.266| 0.287 | 7.084   | 0.004  | 0.697 | 0.638-0.921     |
| Presence of complication             | -0.208| 0.034 | 37.980  | 0.000  | 0.812 | 0.760-0.868     |
| Educational level                    | 0.255 | 0.034 | 42.381  | 0.000  | 1.489 | 1.201-1.967     |
| Income                               | 0.672 | 0.341 | 4.869   | 0.024  | 1.989 | 1.091-3.143     |
| Global treatment satisfaction        | 0.694 | 0.214 | 10.957  | 0.000  | 2.173 | 1.521-3.415     |

IV. DISCUSSION AND CONCLUSIONS

A. Discussion

The key components of self-management for patients with diabetes are MA and TS. In China, the research on MA and TS are limited. Therefore, our study aim to explore the relationship between MA and TS in TYPE 2 diabetes patients treated at CHSC, China, and make out management strategies for diabetes, to improve the effect of community diabetes management23-24. It is a meaningful step for CHSC staffs to determine patients’ adherence and treatment satisfaction to antidiabetic medications in community health service center25. Base on this, they can In-depth review of the patient's situation, and develop targeted chronic disease management strategies to improve the management of diabetes26,27,28.

In our study, only 43.1% patients was observed medication adherence only at community health service center in Guangdong. This result demonstrates that community T2DM patients lack of attention to their own health, and effective and scalable diabetes management methods should be implemented to improve the management effects for the community T2DM patients.

In our study, only 43.1% patients was observed medication adherence only at community health service center in Guangdong. This result demonstrates that community T2DM patients lack of attention to their own health, and effective and scalable diabetes management methods should be implemented to improve the management effects for the community T2DM patients.

Previous studies showed that many factors (age, financial difficulties, ethnicity, social support) were the risk factors of indiabetes29-31. In this study, We used multiple regression to explore the effect factors of MA, and found that there were 7 main factors predicting non-adherence in community patients with T2DM, which is an interesting findings. This implies that effective health management need to be implemented for community T2DM patients in China.

B. Conclusion

The T2DM patients’ medication adherence and treatment satisfaction at CHSC of Guangdong, China are unsatisfactory. Low TS is an important barrier for medication adherence among patients with T2DM.

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