**Factors Related to Medication Adherence among Patients with Type 2 Diabetes in Palestine**

Original Article

Running Head: Factors related to medication adherence

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**ABSTRACT**

The purpose of this study is to assess medication adherence and its relationship with organizational factors and patient characteristics. A convenient sample of 250 patients was selected from all type 2 diabetes patients who were seen regularly (at least two visits) over a period of one year. Pre-structured questionnaires sought information about patient socio-demographic and clinical characteristics, organizational factors, and medication adherence. Weight and height were measured. All prescribed medications were abstracted from patients' medical records. Medication adherence was defined as the Eight-Item Morisky Medication Adherence scale (MMAS-8) score ≥6. Descriptive and comparative statistics were used to describe patient characteristics. All analyses were performed using SPSS v 16.0. The majority were medication adherent (72.4%). The multivariate analysis showed that female participants (OR=0.40, P <0.05) were significantly related to decreased odds of medication adherence, and increased diabetes duration (OR=1.05, P <0.05) was significantly related to increased odds of medication adherence. The proportion of patients who were adherent was high, which was nearly comparable to that reported from many countries. There were significant disparities between female and male participants in their medication adherence. Female participants were less likely to be medication adherent, and all healthcare professionals in the health care system might concern the depression disparity among female and male participants.

***Key words:*** Organizational factors, MMAS-8, medication adherence, type 2 diabetes.

**INTRODUCTION**

Diabetes is a chronic disease that dramatically affects the patient’s life pattern, and the patient must coexist with it for his/her entire whole life (Ali et al., 2012; Mosadeghrad, 2014). Diabetes self–care management most commonly refers to medication adherence, but they also include other dimensions in terms of dietary restriction, physical exercise, and self blood–glucose monitoring levels that are usually used to measure patient adherence (Gazmararian et al., 2009). Anti–diabetic medication is an option resorted in the event of diabetes control failure through diet and exercise (Brown et al., 2004). There are several medication options for diabetes management which are used by the physician according to what fits the patient’s health status. Anti–diabetic medications range from multiple oral hypoglycemic drugs options to various forms of Insulin injections available to cater to individual patients’ lifestyles and health requirements. However, some patients require Insulin to lower their blood glucose level, either alone or in combination with oral hypoglycemic drugs (Ali, 2006).

Medication adherence was measured with the Arabic translated version of the Eight–Item Morisky Medication Adherence Scale (MMAS–8), and about 57% of Palestinian diabetes patients were considered adherent (Sweileh et al., 2014). In Egypt, about 83% of diabetes patients were adherent (Shams and Barakat, 2010). Conversely, the adherence is divided between poor adherence and good adherence, which is reflected in the results of others. Thus, about 45% of diabetes patients were poorly adhered to the treatment with oral hypoglycemic drugs, and almost 39% of them were in good adherence to oral hypoglycemic drugs. Few studies were conducted about medication adherence in Arab countries; most of them were carried out in Palestine and Saudi Arabia (Al-Elq, 2009; Daoud et al., 2014; Khattab et al., 1999; Sweileh et al., 2003; Sweileh et al., 2005). Nevertheless, medication adherence data among Palestinian diabetes patients are still scarce and little is known about medication adherence in Palestine. Hence, this study has assessed medication adherence and its relationship with patient characteristics and organizational factors among type 2 diabetes patients.

**METHODS**

A cross sectional study was carried out to assess the medication adherence and its relationship with patient characteristics and organizational factors among type 2 diabetes patients of the National Center for Chronic Diseases and Dermatology in Ramallah, Palestine. The study was completed over a period of one year for 250 patients diagnosed with type 2 diabetes for one year or more, visited the center at least two times during the previous one year, signed the consent form before participating in the study, and selected by convenient sampling method. Personal interviews and a medical records review for the past one year using a set of questionnaires and data collection forms collected data concerning patient socio-demographic and clinical characteristics, organizational factors, and medication adherence profile.

Eight questions were designed to form MMAS–8 which measures medication adherence. The first seven items are yes/no questions while the last 8th question is answered on a five point Likert scale. Eight scores form the highest scores of the scoring system of MMAS–8, so scores can range from zero to eight. One score is given for each “No” answer except for question number five where one score is given for “Yes” answer. In the eighth question, zero score is given if the answer is ticked on “all the time” item in contrast to “never/rarely” answer where one score is given. Therefore, the total MMAS-8 score is the result of the sum–up of the eight items scores. (Ashur et al., 2016; Jamous et al., 2011; Sweileh et al., 2011; Sweileh et al., 2014; Zyoud et al., 2013). The participants were divided into two medication adherence groups: those non-adherents with the MMAS-8 score <6 and adherent with MMAS-8 score ≥6. The total scores for each organizational factor including quality of follow-up, preventive education, patient-healthcare professional relationship, patient-physicians facilitation and healthcare collaboration were then calculated for each participant, and mean ± Standard Deviation (SD) and median (inter–quartile range: Q1–Q3) scores were calculated for all participants. Descriptive statistics was applied for the analysis of patient socio-demographic and clinical characteristics and the organizational factors data. Binary logistic regression followed by multiple logistic regression were performed to determine factors that are significantly related to medication adherence. The variables that showed significance in the binary logistic regression analyses were used to carry out multiple logistic regression analyses. The p-value equal to or less than 0.05 was considered as significant. Data was analyzed using SPSS version 16.0.

**RESULTS AND DISCUSSION**

**Socio-demographic and clinical characteristics of participants**

Almost 40% of the participants were in their fifties (50–59 years old). More than half of the participants were male (51.2%). The majority of the participants were married (76.7%). The household monthly income for 69.1% of the participants was less than 500 Jordanian Dinars (JDs) monthly. The majority of the participants hold school certificates (66.7%). Approximately, half of the participants had city residence (50.9%). Higher proportions of the participants were housewives (39.4%). The overwhelming majority of the participants were covered by Government Health Insurance only (92.7%). The diabetes duration for 62.7% of the participants was more than ten years, and 11.5% did not suffer from additional chronic diseases. Slightly half of the participants had four or more additional chronic diseases (50.3%). The obesity (Body mass index: ≥30kg/m2) was the most frequently reported (46.1%). The majority of the participants were non–smokers (63.3%). Less than half of the participants took seven or more medications on a regular basis (47%). The reported mean ± SD and median medications number taken on daily basis were 6.4±2.8 and 6.0 (Q1–Q3: 5.0–8.0), respectively.

**Reported organizational factors**

Diabetes preventive education data includes smoking status documentation and diabetes education that is obtained from personal interviews. The mean ± SD total preventive education score was 33.1±16.1, which was higher than average score (i.e. cumulative percentage=66.2%), and the median was 40.0 (Q1–Q3: 20.0–50.0). The mean ± SD total quality of follow–up score was higher than the average score (i.e. mean ± SD = 38.8±13.2; cumulative percentage=55.4%), and the median was 40.0 (Q1–Q3: 32.5–47.5). The mean ± SD and the median total patient-healthcare professionals score was 38.5±15.9 and 30.0 (Q1–Q3: 28.0–52.0), respectively, which was lower than the average score (i.e. cumulative percentage=48.1%). The total patient–physicians facilitation score was higher than the average score (mean ± SD=11.1±2.9; cumulative percentage=69.4%), and the median was 12.0 (Q1–Q3: 9.0–13.0). The mean ± SD total health care collaboration score was 1.6±0.9, which was lower than average score (i.e. cumulative percentage=26.7%), and the median was 1.0 (Q1–Q3: 1.0–2.0).

**Reported medication** **adherence**

The mean ± SD total MMAS–8 score was 6.3±1.6 which was higher than average score (cumulative percentage=78.8%), and the median was 7.0 (Q1–Q3: 5.5–8.0). The majority were considered medication adherent (72.4%), while more than quarter were medication non–adherent (28.0%). Among MMAS–8 dimensions, 33.6% of the participants sometimes forgot to take their anti–diabetic medications; 25.2% did not take their medications for reasons other than forgetting on at least one occasion over the past two weeks before the interview; a small percentage of the participants stopped taking their medications without telling their doctor after feeling worse upon taking their medications (15.6%); Less than quarter of the participants sometimes forgot to take their medications with them when they travelled or left home (21.2%). The overwhelming majority of the participants took all their medications yesterday (i.e. on the day before the interview) (94.8%); 10.8% stopped taking their medications when they felt like their diabetes were under control; 39.6% felt hassled because of their treatment plans; and finally, 70% either rarely or never had difficulty in remembering to take all their medications at least once in a while (Table 1).

Table 1: Self–reported medication adherence of participants (N=250)

| **Item** | **Frequency (%) of patients who answered**  **yes** | |
| --- | --- | --- |
| Do you sometimes forget to take your (health concern) pills? | | 84 (33.6) |
| People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when did not take your (health concern) medicine? | | 63 (25.2) |
| Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it? | | 39 (15.6) |
| When you travel or leave home, do you sometimes forget to bring along your (health concern) medication? | | 53 (21.2) |
| Did you take your (health concern) medicine yesterday? | | 237 (94.8) |
| When you feel like your (health concern) is under control, do you sometimes stop taking your medicine? | | 27 (10.8) |
| Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your (health concern) treatment plan? | | 99 (39.6) |
| How often do you have difficulty remembering to take all your medicine?  Never/Rarely  Once in a while  Sometimes  Usually  All the time | | 175 (70.0)  27 (10.8)  37 (14.8)  4 (1.6)  6 (2.8) |

**Factors relating to medication adherence**

Univariate analysis of factors related to medication adherence showed that gender and diabetes duration were significantly related to medication adherence (Table 2). Female participants were less likely to be medication adherent ([O.R=0.4; 95% C.I of 0.2–0.7]). Participants with long diabetes duration were more likely to be medication adherent ([O.R=1.05; 95% C.I of 1.00–1.10]). According to the multivariate analysis (Table 3), both gender and diabetes duration was still significantly related to medication adherence. Female participants were significantly related to decreased odds of medication adherence. Female participants were less likely to be medication adherent ([O.R=0.40; 95% C.I of 0.22–0.72]) in comparison to male participants. Longer diabetes duration was significantly related to increased odds of medication adherence. Participants diagnosed with type 2 diabetes for a longer time (i.e. higher number of years) were more likely to be medication adherent ([O.R=1.05; 95% C.I of 1.01–1.10]).

Table 2: Univariate analysis of factors related to medication adherence

| **Variable** | **Frequency (%)**  **N=250** | **Adherent**  **N=181**  **(72.4%)** | **Non–adherent**  **N=69**  **(27.6%)** | **Odds ratio with**  **95% C.I** | | **P–Value** |
| --- | --- | --- | --- | --- | --- | --- |
| Age category  28–37  38–47  48–57  58–67  ≥68 | 7 (2.8)  32 (12.8)  79 (31.6)  86 (34.4)  46 (18.4) | 4 (2.2%)  22 (12.2%)  52 (28.7%)  66 (36.5%)  37 (20.4%) | 3 (4.3%)  10 (14.5%)  27 (39.1%)  20 (29.0%)  9 (13.0%) | | Reference (1)  1.7 (0.3–8.8)  1.4 (0.3–6.9)  2.5 (0.5–12)  3.1 (0.6–16.3) | 0.293 |
| Gender  Male  Female | 129 (51.6)  121 (48.4) | 104 (57.5%)  77 (42.5%) | 25 (36.2%)  44 (63.8%) | | Reference (1)  0.4 (0.2–0.7) | 0.003 |
| Marital status  Single  Married | 57 (22.8)  193 (77.2) | 40 (22.1%)  141 (77.9%) | 17 (24.6%)  52 (75.4%) | | Reference (1)  1.2 (0.6–2.2) | 0.669 |
| Income level (JDs)  <500  ≥500 | 168 (67.2)  82 (32.8) | 121 (66.9%)  60 (33.1%) | 47 (68.1%)  22 (31.9%) | | Reference (1)  1.1 (0.6–1.9) | 0.849 |
| Educational level  Illiterate  ≤High school  >High school | 29 (11.6)  157 (62.8)  64 (25.6) | 23 (12.7%)  109 (60.2%)  49 (27.1%) | 6 (8.7%)  48 (69.6%)  15 (21.7%) | | Reference (1)  0.6 (0.2–1.5)  0.9 (0.3–2.5) | 0.382 |
| Occupation  Employed  Unemployed  Housewife | 103 (41.2)  51 (20.4)  96 (38.4) | 79 (43.6%)  40 (22.1%)  62 (34.3%) | 24 (34.8%)  11 (15.9%)  34 (49.3%) | | Reference (1)  1.1 (0.5–2.5)  0.6 (0.3–1.0) | 0.093 |
| Residency place  City  Village and refugee camp | 121 (48.4)  129 (51.6) | 93 (51.4%)  88 (48.6%) | 28 (40.6%)  41 (59.4%) | | Reference (1)  0.6 (0.4–1.1) | 0.128 |
| Additional chronic diseases number | 3.0 (2.0–5.3) | 3.0 (2.0–5.0) | 3.0 (1.0–6.0) | | 1.0 (0.9–1.1) | 0.585 |
| Body Mass Index  Normal  Overweight  Obese | 40 (16.0)  97 (38.8)  113 (45.2) | 31 (17.1%)  67 (37.0%)  83 (45.9%) | 9 (13.0%)  30 (43.5%)  30 (43.5%) | | Reference (1)  0.6 (0.3–1.5)  0.8 (0.3–1.9) | 0.573 |
| Diabetes duration | 13.9±7.8 | 14.6±8.0 | 12.0±7.0 | | 1.05 (1.00–1.10) | 0.018 |
| Smoking status  Smoker  Non–smoker | 94 (37.6)  156 (62.4) | 70 (38.7%)  111 (61.3%) | 24 (34.8%)  45 (65.2%) | | 1.2 (0.7–2.1)  Reference (1) | 0.570 |
| Medications number | 6.0 (4.0–8.0) | 6.0 (5.0–8.0) | 6.0 (4.0–7.0) | | 1.0 (0.9–1.1) | 0.440 |
| Insulin treatment  Yes  No | 188 (75.2)  62 (24.8) | 135 (74.6%)  46 (25.4%) | 53 (76.8%)  16 (23.2%) | | Reference (1)  1.0 (0.6–2.2) | 0.716 |
| Anti–diabetic therapy type  Mono–therapy  Combination | 122 (48.8)  128 (51.2) | 92 (50.8%)  89 (49.2%) | 30 (43.5%)  39 (56.5%) | | Reference (1)  0.7 (0.4–1.3) | 0.299 |
| Preventive education score | 40.0 (20.0–45.0) | 40.0 (20.0–45.0) | 40.0 (20.0–40.0) | | 1.00 (1.00–1.02) | 0.822 |
| Quality of follow–up score | 40.0 (30.0–47.5) | 40.0 (30.0–47.5) | 40.0 (28.8–47.5) | | 1.0 (1.0–1.0) | 0.998 |
| Patient-healthcare professionals relationship score | 30.0 (28.0–52.3) | 30.0 (28.5–53.0) | 30.0 (26.0–52.0) | | 1.00 (0.99–1.03) | 0.274 |
| Patient–physicians facilitation score | 12.0 (9.0–13.0) | 12.0 (9.0–13.0) | 12.0 (7.5–13.0) | | 1.1 (1.0–1.2) | 0.258 |
| Healthcare collaboration score | 1.0 (1.0–2.0) | 1.0 (1.0–2.0) | 2.0 (1.0–2.0) | | 0.9 (0.6–1.1) | 0.286 |
| Diabetes education  Physician  Physician +nurse  Physician +dietician  All healthcare professionals | 132 (52.8)  38 (15.2)  49 (19.6)  31 (12.4) | 97 (53.6%)  24 (13.3%)  35 (19.3%)  25 (13.8%) | 35 (50.7%)  14 (20.3%)  14 (20.3%)  6 (8.7%) | | Reference (1)  0.6 (0.3–1.3)  0.9 (0.4–1.9)  1.5 (0.6–4.0) | 0.435 |

Table 3: Multivariate analysis of factors related to medication adherence

| **Variable** | **Coefficient (β)** | | **S.E** | **Wald** | **Odds ratio with 95% C.I** | **P–value** |
| --- | --- | --- | --- | --- | --- | --- |
| Gender  Male  Female | | –0.92 | 0.30 | 9.52 | Reference (1)  0.40 (0.22–0.72) | 0.002 |
| Diabetes duration | | 0.05 | 0.02 | 6.32 | 1.05 (1.01–1.10) | 0.012 |

The study results differed from other which found that male patients were less likely to be medication adherent (Fitzgerald et al., 1995), while a significant relationship between gender and medication adherence was not found in a study by Senior et al. (2004). However, the study results were in consistency with the findings of another study by Lertmaharit et al. (2005). The family and societal aspects in Palestine lead to depression as a consequence of diabetes, which might extend to female diabetes patients, who are more likely to be depressed than males and interfere with medication adherence, which perhaps could be improved by the depression treatment. This needs evaluation (Kaholokula et al., 2003; Seo and Min, 2005; Voils et al., 2005).

The educational level and patient–healthcare professionals’ relationship were non-significant, but also obvious in a relationship with medication adherence. Medical knowledge might be related to patient educational level. The degree of medication adherence non-significantly increased with an increased educational level. More educated patients tend to be more familiar with the medications and aware of the negative effects from medication non-adherence (Sweileh et al., 2005). Fostering a healthy relationship by emotional support, respect and giving reassurance while treating patients as equal partners engenders patient trust in healthcare professionals such as physicians in concert with positive responsiveness from them is positively reflected in medication adherence (Lawson et al., 2005). Thus, patients follow-up is needed to encourage them to keep up with the given treatment and advice and ensure that they remember the given information.

**CONCLUSIONS**

The patients’ proportion with medication adherence was high, and the level of medication adherence was appropriate. There was significant difference between medication adherents and non–adherents in gender and diabetes duration. Female participants were less likely to be medication adherent. All healthcare professionals in the health care system might concern the diabetes duration and the depression variance among female and male participants. Particular attention paid to depression could lead to an enhancement in medication adherence.

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**Conflict of Interests:** The authors declare that they have no competing interest in this research study.

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