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# The Management of Care of Egyptian Patients with Diabetes: A Report from the International Diabetes Management Practices Study Wave 7

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## Abstract

*Background:* Diabetes Mellitus (DM) is a major and growing public health problem throughout the world. In developing countries, there is a scarcity in the published data regarding the quality of care of DM, including non-adherence of the patients, poor glycemic control, and the long-term consequences of DM.

*Aim of Study:* The International Diabetes Management Practices Study (IDMPS) was developed to provide standardized data about the management of care of patients with diabetes in developing countries. In this report, we presented the results of the seventh wave of IDMPS about the management of care of DM in Egypt.

*Patients and Methods:* IDMPS is an international, multicenter, observational, cross-sectional study to assess current practices in the management of care of people with DM. The primary outcome in the present study was the proportion of patients achieving glycemic targets (HbA1c) as per recommendations of International guidelines (HbA1c <7%) and as targeted by the treating physician. While the secondary outcomes included the proportion of patients achieving the triple target (defined as the combination of HbA1c <7%, Systolic/Diastolic Blood Pressure [SBP/DBP] <130/80, and Low-Density Lipoprotein (LDL-CS) <100mg/dL), the proportion of patients with micro and macrovascular complications, the compliance to diet and lifestyle modification, the adherence to insulin therapy of T2DM treated by insulin, and the frequency and the severity of episodes of hypoglycemia in the past 3 months.

*Results:* In Egypt, a total of 449 patients met the eligibility criteria for analysis. Of them, 149 (33.3%) were Type 1 DM (TIDM) patients and 300 (66.7%) were Type 2 DM (T2DM) patients. In patients with T2DM, 219 (73%) patients were on oral antidiabetic agents, 26 (8.7%) patients were on insulin therapy, and 55 (18.3%) patients received insulin plus hypoglycaemic agents. The majority of T2DM, who were on insulin, received premix insulin alone. Sixty-three (42.3%) T 1DM patients were on basal + prandial insulin, 56 (37.6%) patients were on premix alone, 14 (9.4%) patients were on premix + prandial insulin, eight (5.4%) patients were on premix + basal insulin, six (4.0%) patients were on basal insulin alone, and two (1.3%) patients were on premix insulin alone. A total of 12 (15.4%) T 1DM patients were on premixed analogue insulin.

A total of 12.2% and 17.8% of the T1DM and T2DM patients achieved the glycaemic target HbA1c <7% as per recommendations of international guidelines; while, 8.8% of T 1 DM patients and 13.6% of T2DM patients had an HbA1c below the targeted value per physicians' recommendation. The triple target was reached by only 1.4% of T1DM and 2.4% of T2DM patients. Only 214 (48.3%) patients had glucose meter; of them, 194 (90.7%) patients performed self-monitored blood glucose, mainly occasionally. In our cohort, a total of 49.7% of the patients reported one or more diabetes-related complications. In T2DM group, 51.7% of the patients had microvascular complications, mainly microalbuminuria and retinopathy. On the other hand, 17% of T2DM reported macrovascular complications, most commonly angina and myocardial infarction. Among T1DM patients, 42.9% experienced symptomatic episodes of hypoglycaemia in the past three months and 10.1% experienced severe episodes of hypoglycaemia in the past 12 months.

*Conclusion:* In conclusion, the control of diabetes in Egypt is still poor with the vast majority of the patients do not achieve the targeted metabolic control as recommended by the international guidelines.

***Key Words:*** *Diabetes mellitus – Glycaemic control – Management of care – IDMPS project.*

## Introduction

**DIABETES** Mellitus (DM) is a major public health burden with significant morbidity and mortality worldwide **[1]**. Recent global figures estimated that one in every 11 adults has DM (90% type 2 diabetes **[2]**; while 6.8% of the global mortality in 2010 was attributed to DM **[3]**. More than 400 million people are currently living with diabetes worldwide, and that figure is expected to rise to more than 600 million by 2045 **[4]**. This means there will be 50 percent more people living with diabetes in the next 25 years. This rise is predicted to occur virtually in every nation, with the greatest increases

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expected in developing countries. Furthermore, the International Diabetes Federation (IDF) estimates that at least 50% of people with diabetes are unaware of their condition [4,5]. Egypt is the eighth leading country regarding the prevalence of DM; In 2017, it was estimated that more than eight million adults live with DM in Egypt, which represents a prevalence of almost 15% [5]. Type 2 DM (T2DM) is the most common type of diabetes that is characterized by the development of insulin resistance as well as the progressive failure of pancreatic beta-cell function, with subsequent hyperglycemia [6]. In addition to the primary pathology, common comorbidities such as renal, cardiovascular disease, and stroke are usually associated with T2DM [7].

The United Kingdom Prospective Diabetes Study (UKPDS) in subjects with DM supports the position that early treatment of diabetes with tight blood glucose control can decrease the morbidity and mortality of the disease by decreasing its chronic complications. Therefore the major goal of treatment of patients with diabetes is to achieve good (near normal) metabolic control, thus preventing the onset of long-term complications [8]. The 2019 American Diabetic Associations recommended a glycated hemoglobin (HbA1c) of <7% [9]. Poorly-controlled DM is associated with a wide range of micro and macro-vascular complications; alongside cardiovascular morbidity, patients with uncontrolled DM are at increased risks of nephropathy, retinopathy, and neuropathy [10,11]. To achieve the targeted metabolic control, a combination of lifestyle modification and pharmacological agents are prescribed for patients with DM. However, recent global figures showed that the majority of patients with long duration of diabetes remain poorly controlled [12].

Various barriers, which hinder the achievement of good metabolic control in patients with DM, were reported in developing countries including non-adherence of the patients, cultural beliefs, financial support, lack of knowledge about the long-term consequences of DM, poor access to healthcare services, and clinician's knowledge and attitude [13]. In developing countries, there is a scarcity in the published data regarding the quality of care of DM. Therefore, the International Diabetes Management Practices Study (IDMPS) was developed to provide standardized data about the management of care of patients with diabetes in developing countries [14]. In this report, we presented the results of the seventh wave of IDMPS about the management of care of DM in Egypt.

## Patients and Methods

We followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology Statement) guidelines during the preparation of this study [15].

*Study design and setting:* This study was a multicenter, observational, cross-sectional study conducted during the period of July 2016 to August 2016 in 30 Diabetic Centers (Private Clinics) in Egypt as a part of the International Diabetes Management Practices Study (IDMPS).

IDMPS is an international, multicenter, observational, cross-sectional study, to assess current practices in the management of care of people with DM. This cross-sectional study is composed of yearly surveys with a recruitment period of two weeks' duration. The first wave of the study was performed in 2005. As of today, seven waves have been performed, each of them exploring a specific domain of research in the management of care of people with diabetes. In wave 7, a total of 24 countries, representing four regions, were included. The number and profile of the physicians to participate in the study were determined on a country basis. The number of physicians depended on the patients' sample size of the country. Each physician was requested to enroll the first ten T2DM adult patients visiting him/her during the two weeks' recruitment period of the cross-sectional study, as well as the first five T 1 DM patients visiting him at the same time.

*Eligibility criteria of the study participants:*

We enrolled adults' patients, of both sexes, who were diagnosed with T1DM or T2DM and visiting the physician during the recruitment period of the study. Written informed consents were collected prior to the study's enrollment. Patients with concomitant participation in a clinical trial, previous participation in this study, and/or current temporary insulin therapy were excluded from the study.

*Variables and data collection methods:*

Only one Case Report Form (CRF) per patient was completed by the physician to document patient demography, patient's socio-economy profile, diabetes medical history including diabetes-related complications, physical examination, cardiovascular risks factors (hypertension, lipid profile plus smoking habits), glycemic control (fasting (FBG) and post-prandial blood glucose, HbA1c), self-monitoring blood glucose, episodes of hypoglycemia as well as concomitant anti-diabetic therapy, patient education, and adherence to medications.

*Study outcomes:*

The primary outcome in the present study was the proportion of patients with diabetes achieving glycemic targets as per recommendations of International guidelines (HbA1c <7%) and as targeted by the treating physician. While the secondary outcomes included the proportion of patients achieving the triple target (defined as the combination of HbA1c <7%, Systolic/Diastolic Blood Pressure [SBP/DBP] <130/80, and Low-Density Lipoprotein (LDL-CS) <100mg/dL), the proportion of patients with micro and macrovascular complications, the compliance to diet and lifestyle modification, the adherence to insulin therapy of T2DM treated by insulin, and the frequency and the severity of episodes of hypoglycemia in the past 3 months. The adherence to insulin treatment was assessed by asking the patient if he/she ever discontinued insulin since treatment initiating and the reasons for discontinuation.

*Statistical methods:*

Qualitative data were summarized using number and percentages; while quantitative data were summarized using mean ± Standard Deviation (SD). Statistical analyses were conducted with the SAS Software version 9.2.

## Results

*Demographic characteristics:* In Egypt, a total of 450 DM patients were recruited. Of them, 449 patients met the eligibility criteria for analysis, distributed in 149 (33.3%) T1DM patients, and 300 (66.7%) T2DM patients. The mean age of the included patients was 46.23± 14.09 years old, and the majority of the patients were females (51.2%). Almost 73% of the patients were from Arab ethnicity. Most of the patients were from urban areas (85.7%), and 55% of them had university/higher education. Only 14.7% of the patients were unemployed. Out of 216 (48.5%) patients with health insurance, 115 (53.2%) patients had public health insurance. In the study, 54.0% of T2DM patients ever received diabetes education, and 68.3% were involved in an educational program provided by the physician or his/her clinical staff. The mean duration since the diagnosis was 14.33 ± 9.63 years in T1DM patients and 10 ±7.06 years in T2DM patients. The majority of patients (64.8%) had a family history of diabetes. The mean Body Mass Index (BMI) for patients with T1DM and T2DM was 26.74±4.16 and 31.51 ±5.27kg/m$^2$, respectively. Thirty-seven percent of T1DM had Systolic Blood Pressure (SBP) of more than 130 mmHg, compared to 59.9% in T2DM group. Overall, 17.4% and 41.2% of the patients had hypertension in T 1 DM and T2DM groups, respectively. In addition, 31.4% and 55.6% of the patients had dyslipidemia in T 1 DM and T2DM groups, respectively. The mean creatinine level of the included patients was 1.07±0.9mg/dl. Table (1) shows the characteristics of the included patients.

*Treatment regimens:*

Out of the 300 patients with T2DM, 219 (73%) patients were on oral antidiabetic agents; almost half of those patients were on metformin + sulphonylureas and five patients (1.7%) were on Glucagon-Like Peptide 1 (GLP-1) analogues. On the other hand, 26 (8.7%) T2DM patients were on insulin therapy and 55 (18.3%) patients received insulin plus hypoglycaemic agents. Among the 81 insulin-treated T2DM patients, premix alone was prescribed in 61.7% of them. Sixty-three (42.3%) T 1 DM patients were on basal + prandial insulin, 56 (37.6%) patients were on premix alone, 14 (9.4%) patients were on premix + prandial insulin, eight (5.4%) patients were on premix + basal insulin, six (4.0%) patients were on basal insulin alone, and two (1.3%) patients were on premix insulin alone. A total of 12 (15.4%) T 1 DM patients were on premixed analogue insulin Fig. (1). The mean duration of insulin treatment was 13.83 ±9.49 years and the mean insulin dose ranged from 22.53 to 86.63IU. Self-management of both blood glucose and insulin was performed in 56.6% of T1DM patients. The proportions of patients, who had glucose meter, were 37.4% in T2DM group and 69.8% in T1DM group. Of the 214 patients with glucose meter, 194 (90.7%) patients performed self-monitored blood glucose, mainly occasionally.

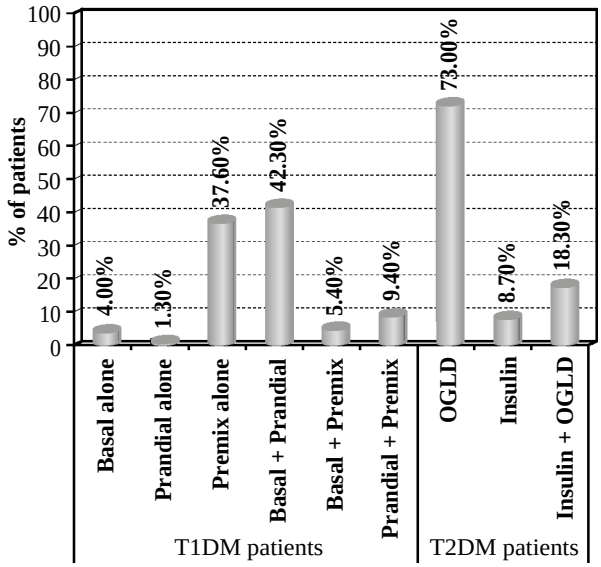


Fig. (1): Treatment lines of the included patients.

T1DM: Type 1 Diabetes Mellitus.
T2DM: Type 2 Diabetes Mellitus.
OGLD: Oral Glucose Lowering Drugs.

Table (1): Demographic and clinical characteristics of the included patients.

| Variable | T1DM (N=149) | T2DM (N=300) | Total |
|---|---|---|---|
| Age (years), Mean (SD) | 31.42 (9.89) | 53.59 (9.24) | 46.23 (14.09) |
| Male, No (%) | 74 (49.7%) | 145 (48.3%) | 219 (48.8%) |
| *Ethnicity, No (%):* | | | |
| - Caucasian | 39 (26.2%) | 81 (27.0%) | 120 (26.7%) |
| - Oriental, Arab, Persian | 110 (73.8) | 219 (73.0%) | 329 (73.3%) |
| Urban area, No (%) | 132 (88.6%) | 253 (84.3%) | 385 (85.7%) |
| University/higher education, No. (%) | 95 (63.8%) | 153 (51%) | 248 (55.2%) |
| *Type of health insurance, No. (%):* | | | |
| - No | 70 (47.9%) | 159 (53.2%) | 229 (51.5%) |
| - Public | 40 (52.6%) | 75 (53.6%) | 115 (53.2%) |
| - Private | 29 (38.2%) | 49 (35%) | 78 (36.1%) |
| - Public + private | 7 (9.2%) | 16 (11.4%) | 23 (10.6%) |
| *Smoking habits, No. (%):* | | | |
| - Never | 117 (78.5%) | 196 (65.3%) | 313 (69.7%) |
| - Former | 12 (8.1%) | 51 (17%) | 63 (15%) |
| - Current | 19 (12.8%) | –17.70% | 72 (16%) |
| Duration of diabetes (years), Mean (SD) | 14.33 (9.63) | 10.00 (7.06) | 11.43 (8.25) |
| Last FBG (mg/dl), Mean (SD) | 157.74 (56.96) | 158.02 (52.09) | 157.93 (53.72) |
| Last PPBG (mg/dl), Mean (SD) | 222.32 (88) | 220.43 (71.54) | 221.06 (77.36) |
| Family history of DM, No. (%) | 90 (61.6%) | 184 (66.4%) | 274 (64.8%) |
| Weight (kg), Mean (SD) | 74.94 (13.19) | 89.57 (14.54) | 84.71 (15.69) |
| Height (cm), Mean (SD) | 167.30 (8.33) | 168.83 (8.98) | 168.32 (8.79) |
| BMI ($kg/m^2$), Mean (SD) | 26.74 (4.16) | 31.51 (5.27) | 29.92 (5.41) |
| SBP (mmHg), Mean (SD) | 122.21 (15) | 133.75 (16.12) | 129.92 (16.65) |
| DBP (mmHg), Mean (SD) | 77.57 (9.22) | 82.47 (9.82) | 80.85 (9.88) |
| Patient diagnosed with hypertension, No (%) | 26 (17.4%) | 159 (53%) | 185 (41.2%) |
| Patient treated for hypertension, No (%) | 25 (96.2%) | 157 (98.7%) | 182 (98.4%) |
| Familial hypercholesterolemia, No (%) | 10 (8.1%) | 16 (6.7%) | 26 (7.2%) |
| Dyslipidemia, No. (%) | 38 (31.4%) | 149 (55.6%) | 187 (48.1%) |

T1DM : Type 1 Diabetes Mellitus. FBG : Fasting Blood Glucose. BMI : Body Mass Index.
T2DM : Type 2 Diabetes Mellitus. PPBG : Postprandial Blood Glucose. SBP : Systolic Blood Pressure.
SD : Standard Deviation. DM : Diabetes Mellitus. DBP : Diastolic Blood Pressure.

*Study' outcomes:*

The mean Hb1Ac was 8.31 ± 1.56% in T1DM patients and 8.28± 1.56% in T2DM patients. A total of 12.2% of the T 1 DM patients and 17.8% of the T2DM patients achieved the glycaemic target HbA1c <7% as per recommendations of international guidelines Fig. (2). Comparing the last HbA 1 c measurement with the HbA 1 c target value considered by the physician, 8.8% of T1DM patients and 13.6% of T2DM patients had an HbA 1c below the targeted value. In insulin-treated patients, the glycaemic goals as targeted by the treating physician were achieved in 33.6% of T1DM patients and 17.3% of the T2DM patients Fig. (2).

Among the patients who did not achieve the targeted glycaemic goals, the reasons for non-achievement were mostly the lack of diabetes education (53.7%), the lack of experience in the self-management of insulin dosing (35.8%) and the lack of titration of insulin (34.3%), Fig. (3).

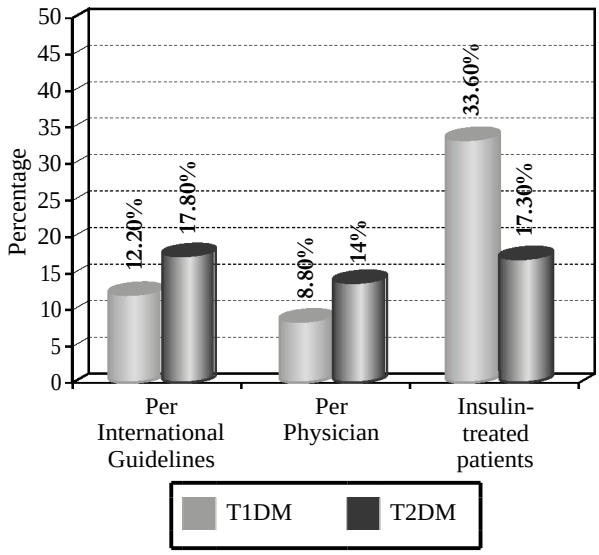


Fig. (2): The proportion of patients with targeted HbA1c (for international guidelines: HbA1c <7%).

T1DM: Type 1 Diabetes Mellitus.
T2DM: Type 2 Diabetes Mellitus.

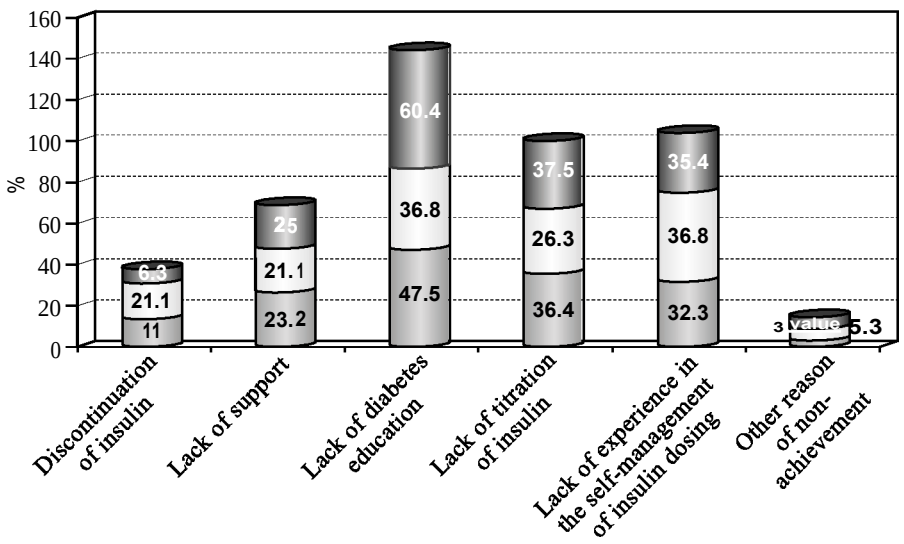


Fig. (3): Reasons for non-achievement of the targeted HbA 1 c.

T1DM: Type 1 Diabetes Mellitus.
T2DM: Type 2 Diabetes Mellitus.
OGLD: Oral Glucose-Lowering Drugs.
*: Any patients may have more than 1 reason for non-achievement.

In terms of the secondary outcomes of the present study, the triple target (HbA1c <7%, SBP/ DBP <130/80mmHg and LDL-CS <100mg/dL as per recommendations of International guidelines) was reached by only 1.4% of T 1 DM and 2.4% of T2DM patients. The non-achievement of the triple targets was due to HbA1c level ≥7% in 85.2%, abnormal blood pressure for 88.8%, and LDL level ≥ 100mg/dL for 77.9%. In addition, 11.2% and 14.3% of the T 1 DM and T2DM patients discontinued insulin therapy at least once. The most common cause of discontinuation was fear of hypoglycaemia, followed by lack of experience in insulin dosing and the impact of insulin therapy on social life. Almost 41.3% of the patients reported that they were adherent to a healthy diet and exercise plan (Table 2).

*Diabetes-related complications:* In our cohort, a total of 49.7% of the patients reported one or more diabetes-related complications. In T2DM group, 51.7% of the patients had microvascular complications, mainly microalbuminuria and retinopathy. On the other hand, 17% of T2DM reported macrovascular complications, most commonly angina and myocardial infarction. Among T2DM patients, 10.2% experienced symptomatic episodes of hypoglycaemia in the past 3 months and only 2.4% experienced severe episodes of hypoglycemia (requiring assistance) in the past 12 months. Hospitalizations due to diabetes were reported for 7.9% of T2DM patients during the past 12 months. Among T1DM patients, 42.9% experienced symptomatic episodes of hypoglycaemia in the past 3 months and 10.1% experienced severe episodes of hypoglycaemia (requiring assistance) in the past 12 months. Hospitalizations due to diabetes were reported for 22.1 % of T 1 DM patients during the past 12 months (Table 3).

Table (2): The distribution of secondary outcomes among the included patients.

| Variables | T1DM (N=149) | T2DM (N=300) | | | |
|---|---|---|---|---|---|
| | | OGLD treatment | Insulin treatment | OGLD treatment + Insulin treatment | Total (N=449) |
| *Triple target reached, No (%):* | | | | | |
| • Achieved | 2 (1.4%) | 7 (3.3%) | 0 | 0 | 9 (2.1%) |
| • *Not achieved:* | | | | | |
| HbA1c ≥7% | 129 (94.2%) | 166 (84.7%) | 19 (73.1%) | 51 (92.7%) | 365 (88.2%) |
| SBP ≥130mmHg and/or DBP ≥80mmHg | 89 (64%) | 188 (91.7%) | 20 (76.9%) | 46 (83.6%) | 343 (80.7%) |
| LDL ≥100mg/dl | 36 (70.6%) | 84 (76.4%) | 11 (73.3%) | 32 (84.2%) | 163 (76.2%) |
| Patient follow a healthy diet and exercise plan | 69 (48.6%) | 87 (42.2%) | 6 (26.1%) | 13 (24.5%) | 175 (41.3%) |
| Patient ever discontinued insulin therapy in the past | 16 (11.2%) | | 6 (24%) | 5 (9.6%) | 27 (12.3%) |
| Duration of discontinuation (months), mean (SD) | 2.01 (1.75) | – | 2.42 (1.02) | 5.60 (2.88) | 2.82 (2.30) |

T1DM : Type 1 Diabetes Mellitus.
T2DM : Type 2 Diabetes Mellitus.
SD : Standard Deviation.
SBP : Systolic Blood Pressure.
DBP : Diastolic Blood Pressure.
LDL : Low-Density Lipoprotein.
HbA1c : Glycated Hemoglobin.
OGLD : Oral Glucose Lowering Drugs.

Table (3): The distribution of diabetes-related complications among the included patients.

| Variables, No. (%) | T1DM (N=149) | T2DM (N=300) | | | Total |
|---|---|---|---|---|---|
| | | OGLD treatment | Insulin treatment | OGLD treatment + Insulin treatment | |
| • Any diabetes-related complication. | 56 (37.6%) | 105 (47.9%) | 16 (61.5%) | 55 (83.6%) | 223 (49.7%) |
| • At least one microvascular complication. | 54 (36.2%) | 79 (44.3%) | 16 (61.5%) | 42 (76.4%) | 209 (46.5%) |
| • Retinopathy. | 19 (12.8%) | 29 (13.2%) | 2 (7.7%) | 12 (21.8%) | 62 (13.8%) |
| • Visual impairment affecting daily living. | 20 (13.4%) | 14 (6.4%) | 1 (3.8%) | 10 (18.2%) | 45 (10%) |
| • Sensory neuropathy (abnormal sensation in distal limbs). | 39 (26.2%) | 83 (37.9%) | 15 (57.7%) | 35 (63.6%) | 172 (38.3%) |
| • Microalbuminuria (lab test or desktop machine). | 14 (9.4%) | 17 (7.8%) | 6 (23.1%) | 8 (14.5%) | 45 (10%) |
| • Proteinuria (dip stick). | 4 (2.7%) | 5 (2.3%) | 3 (11.5%) | 4 (7.3%) | 16 (3.6%) |
| • Amputation. | 1 (0.7%) | 1 (0.5%) | 0 | 0 | 2 (0.4%) |
| • Active foot ulcer. | 1 (0.7%) | 3 (1.4%) | 0 | 0 | 4 (0.9%) |
| • Past history of foot ulcer. | 4 (2.7%) | 3 (1.4%) | 2 (7.7%) | 0 | 9 (2%) |
| • At least one macrovascular complication. | 6 (4%) | 26 (11.9%) | 7 (26.9%) | 18 (32.7%) | 57 (12.7%) |
| • Angina. | 5 (3.4%) | 19 (8.7%) | 6 (23.1%) | 13 (23.6%) | 43 (9.6%) |
| • History of myocardial infarction/acute coronary syndrome. | 0 | 7 (3.2%) | 2 (7.7%) | 3 (5.5%) | 12 (2.7%) |
| • History of heart failure. | 0 | 0 | 2 (7.7%) | 1 (1.8%) | 3 (0.7%) |
| • History of stroke with partial recovery. | 1 (0.7%) | 0 | 1 (3.8%) | 2 (3.6%) | 4 (0.9) |
| • History of stroke with full recovery. | 0 | 2 (0.9) | 0 | 1 (1.8%) | 3 (0.7%) |
| • Peripheral vascular disease (absent foot pulse or ABI <0.9). | 1 (0.7%) | 1 (0.5%) | 3 (11.5%) | 2 (3.6%) | 7 (1.6%) |
| • History of revascularization (e.g. PTCA, CABG). | 1 (0.7%) | 3 (1.4%) | 1 (3.8%) | 4 (7.3%) | 9 (2%) |
| • Other complications. | 0 | 1 (0.5%) | 0 | 0 | 1 (0.2%) |
| • Number of hospitalizations due to diabetes during the past 12 months, Mean (SD). | 0.40 (1.00) | 0.07 (0.35) | 0.27 (1.04) | 0.28 (0.60) | 0.22 (0.72) |
| • Hospitalizations due to diabetes during the past 12 months. | 32 (22.1%) | 10 (4.8%) | 2 (7.7%) | 11 (20.4%) | 55 (12.6%) |

T1DM : Type 1 Diabetes Mellitus. SD : Standard Deviation. PTCA : Percutaneous Transluminal Coronary Angioplasty.
T2DM : Type 2 Diabetes Mellitus. ABI : Ankle-Brachial Index. CABG : Coronary Artery Bypass Graft.
OGLD : Oral Glucose Lowering Drugs.

## Discussion

The present report included Egyptian patients who participated in the seventh wave of the IDMP S. The results showed that only 16% of the Egyptian patients with diabetes achieved the targeted glycaemic control according to the recommendation of the international guidelines (12.2% of T1DM and 17.8% of the T2DM). Moreover, only 8.8% and 13.6% of T 1 DM and T2DM patients, respectively, achieved the targeted glycaemic control as defined by the treating physicians. The high rate of poor glycaemic control in Egyptian patients was attributed to various reasons, mainly lack of diabetes education, lack of experience in the self-management of insulin dosing (35.8%) and lack of titration of insulin. Few patients with diabetes (1.4% of T1DM and 2.4% of T2DM patients) achieved the triple target during the study's period. In terms of non-adherence, almost 11% of the patients discontinued insulin therapy at least once. The most common cause of discontinuation was fear of hypoglycaemia, followed by lack of experience in insulin dosing and the impact of insulin therapy on social life. On the other hand, the Egyptian patients reported high rate of microvascular complications and diabetes-related hospitalization.

Egypt is one of the largest countries in the Middle East with an estimated population of 90 million. Owing to the dramatic changes in the sociodemographic characteristics of the Egyptian population, the prevalence of chronic non-communicable diseases in Egypt has shown a sharp rise in the past 20 years **[16,17]**. In 2013, the prevalence of DM in Egypt was 16% (around 7.5 million individuals), this figure is expected to rise to 13.1 million patients by 2035 **[18,19]**. Therefore, DM is a major public health burden in Egypt with a significant impact on morbidity, mortality, and health care resources **[20]**. On the other hand, poorly-controlled DM is associated with a wide range of micro and macro-vascular complications. Thus, having a high proportion of patients with poorly-controlled DM can represent a heavier burden on the Egyptian healthcare system. In the present study, we found that only 16% of the Egyptian patients with diabetes achieved the targeted glycaemic control according to the recom-

mendation of the international guidelines. This percentage was even lower when considering the glycaemic target set by the treating physicians. Few patients with diabetes (1.4% of T1DM and 2.4% of T2DM patients) achieved the triple target during the study's period. This low proportion of patients with adequate glycaemic control is similar to studies from Middle East. For example, Alfadda and Abdulrahman **[21]** reported that only 24.7% of Saudi patients with T2DM had adequate glycaemic control. Other reports from Saudi Arabia reported the proportion of patients with adequate glycaemic control was 24.2% **[22]** and 23% **[23]**. A large proportion of patients with diabetes from Lebanon and the United Arab Emirates was reported to be inadequately controlled as well **[24-26]**. A recent report from IDMPS showed that only 40% of the patients with diabetes achieved the target glycaemic control across 24 countries from Africa, the Middle East, South Asia, and Eurasia **[27]**. However, other reports demonstrated a much lower proportion of patients with adequate glycaemic control. For example, a study on 490 T2DM patients from Alexandria reported that only 0.8% of the patients achieved HbA1c below 7% **[28]**.

While the exact causes of the large proportion of poorly uncontrolled patients in Egypt are unknown, many factors may contribute to this observation. Lack of proper knowledge about diabetes care and the consequences of poor glycaemic control is one of the main reasons for poor glycemic control in patients with diabetes. According to previous reports, diabetes knowledge correlated significantly with the level of glycemia control and self-care activities **[29,30]**. In the present study, we demonstrated that the lack of diabetes education and the lack of experience in the self-management of insulin dosing were the most common reasons for poor glycemic control. These findings are similar to previous observational studies that demonstrated low level of diabetes education among Egyptian patients with diabetes **[31,32]**.

Adherence to lifestyle modification and diabetes management plans is critical to achieve the targeted glycaemic control. The current body of evidence shows that the adherence to diabetic management plans is poor in Middle East owing to wide range of cultural, personal, and treatment-related factors **[33]**. In the present study, almost 1 1% of the patients discontinued insulin therapy at least once. The most common causes of discontinuation were lack of diabetes education, lack of experience in the self-management of insulin dosing, lack of titration of insulin, fear of hypoglycaemia, and the impact of insulin therapy on social life. In line with our findings, a recent literature review on the adherence to diabetic management plans in Jordan identified poor adherence to management plan, mainly due to lack of diabetes education and awareness about the role of good glycaemic control on diabetes outcomes **[34]**. Other reports showed that diabetes education, awareness about diabetes-related complications, and hypoglycaemia were among the most common determinants of patients adherence to management plan **[35-37]**.

In conclusion, the control of diabetes in Egypt is still poor with the vast majority of the patients do not achieve the targeted metabolic control as recommended by the international guidelines. Likewise, the rate of adherence to optimal management of care is still low. Lack of proper knowledge about diabetes care and the consequences of poor glycaemic control are the main reasons for this low rate of adherence. On the other hand, the Egyptian patients reported a high rate of microvascular complications and diabetes-related hospitalization. Further studies are needed to find out the possible causes of this defective care of diabetic patients in Egypt.

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# الممارسات العلاجية لمرضى السكرى فى مصر، تقرير من الجزء السابع للدراسة الدولية للممارسات العلاجية لمرض السكرى

الخلفية: تم تطوير الدراسة الدولية للمارسات العلاجية لمرض السكرى لتوفير بيانات موحدة حول الرعاية الصحية لمرضى السكرى فى البلدان النامية.

الهدف من العمل: هدفت الدراسة الفعلية القائمة إلى توفير نتائج الموجة السابعة من برنامج حول الممارسات العلاجية لمرضى السكرى فى مصر.

المرضى وطرق العلاج: فى الدراسة الإستطلاعية القائمة، قمنا بتحليل نسبة مرضى السكرى الذين حققوا آهداف نسبة السكر فى الدم وفقاً لتوصيات التوجيهيات الدولية وحسب آراء الطبيب المعالج. بينما تضمنت النتائج الثانوية نسبة المرضى الذين حققوا الهدف الثلاثى ونسبة المرضى الذين يعانون من مضاعفات الأوعية الدموية الدقيقة والأوعية الدموية الكبيرة، والإمتثال لنظام غذائى وتعديل نمط الحياة، والإلتزام بعلاج الأنسولين، وتكرار وشدة نوبات نقص السكر فى الدم فى الآشهر الثلاثة الماضية.

النتائج: فى مصر، تم دراسة ٤٤٩ مريضاً. حقق ما مجموعة ١٢.٢ و١٧.٨ من مرضى السكرى النوع الآول والثانى هدف نسبة السكر فى الدم وفقاً لتوصيات الإرشادات الدولية. تم الوصول إلى الهدف الثلاثى بنسبة ١.٤٪ فقط من مرضى السكرى النوع الآول و٢.٤٪ من مرضى السكرى النوع الآول. فقط ٢١٤ (٤٨.٣٪) من المرضى لديهم عداد جلوكوز. ومن بين هؤلاء ، قام ١٩٤ (٩٠.٧٪) من المرضي بإجراء جلوكوز الدم الذى يخضع للمراقبة الذاتية، بشكل آساسى. فى مجموعتنا، آبلغ ما مجموعة ٤٩.٧٪ من المرضى عن واحداً آو آكثر من المضاعفات المرتبطة بمرض السكرى.

الخلاصة: السيطرة على مرض السكرى فى مصر لا تزال ضعيفة مع الغالبية العظمى من المرضى لا يحققون التحكم الآيضى المستهدف كما آوصت به الإرشادات الدولية.