

The Situation Among Egyptian Elderly with Type 2 Diabetes; A Call for Action

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ABSTRACT

Background: Egypt is listed as one of the top ten countries with people with diabetes. Moreover, percentage of elderly population is growing due to improvement of health care services. Unfortunately, there is a paucity of national data about the situation among elderly patients with type 2 diabetes (T2D).

Objective: The aim of this study was to estimate the gap between recommendations of guidelines and real-world data regarding control of glycaemic state and its associated risk factors.

Patents and methods: The current study was conducted on 207 patients with T2D aged 60 years and more, both males and females. Comprehensive geriatric assessment was done, and laboratory data were collected from the participants after exclusion of other types of diabetes

Results: The mean age of the patients was 66.59 ± 4.36 years and 132 of participants were females. 69 % of the patients were known to have hypertension and on regular medical treatment. Furthermore, the mean glycosylated haemoglobin (HbA1c) was 8.34 ± 1.09 % and only 14% have HbA1c less than 7.5 %. On the other hand, just 28 patients were taking statins regularly.

Conclusion: It could be concluded that there is a large gap between the guideline's recommendation and the situation in real life. Morbidity and mortality rates will increase among those population and surely will increase the health burden on the health care providers in a developing country like Egypt. More education is recommended for the doctors and patients.

Key words: Elderly, Type 2 Diabetes; Glycated Haemoglobin, Hypertension.

INTRODUCTION

Diabetes Mellitus (DM) is considered as rapidly growing global health problem. Egypt is listed as one of the top ten countries having people living with DM. According to the International Diabetes Federation (IDF), Egypt has 10.9 million people living with diabetes (aged from 20-79 years) in 2021 and it is expected to be duplicated in 2045 by reaching about 20 million patients with DM ⁽¹⁾.

On the other hand, in the last few decades it is documented that there is increase in the absolute and relative number of elderlies in Egypt. According to the central agency for public mobilization and statistics, elderlies represent about 7% of total Egyptian population in 2019 and by the year 2030 they expected to represent about 12% to the total population ⁽²⁾.

Prevalence of DM is increased with age. The lowest prevalence is recorded among adults aged between 20–24 years (2.2% in 2021). Surprisingly, prevalence of DM is 24.0% in 2021 among adults aged between 75–79 years and expected to reach 24.7% by the year 2045 ⁽¹⁾.

Certainly, with growing of the Egyptian elderlies the proportion of DM among them will increase and subsequently -if not managed properly- the morbidity and mortality rates will increase, and health care providers will pay more cost for that, and this is a major problem in a developing country like Egypt. With daily practice, detailed history taking with elderly patients with Type 2 diabetes (T2D) show that many of them are not keen to monitor their blood pressure and their glycaemic state nor screen for diabetes complications

annually. Furthermore, paucity of patients who are doing their routine screening tests is away from the target of most guidelines particularly the American Diabetes Association (ADA) which is popular guidelines for many physicians in Egypt.

This study was aimed to explore the control of glycaemic state, blood pressure and lipid profile among Egyptian elderly patients with T2D according to ADA 2022 guidelines.

PATIENTS AND METHODS

This non-interventional cross-sectional study included a total of 207 Egyptian elderly patients, both males and females aged 60 years or older, attending at Geriatric and Diabetes Outpatient Clinics of Specialized Medical Hospital, Mansoura University, and private clinics.

Exclusion criteria: Other types of DM rather than T2D, patients with secondary hypertension, patients who were not compliant on their treatment, patients had psychological disease as depression and psychosis, patient with known other endocrinal diseases like hypopituitarism, acromegaly, Cushing's disease, and patients with familial dyslipidaemia.

Detailed medical history was taken (including drug history and comorbid conditions). General Examination was done for all participants including measurement of brachial blood pressure and body mass index (BMI). Glycated Haemoglobin (HbA1c), lipid profile and creatinine were measured and estimated Glomerular Filtration Rate (eGFR) was calculated using the original

Modification of Diet in Renal Disease (MDRD) 4 variable equation.

Ethical Consideration:

This study was ethically approved by Mansoura University's Institutional Review Board. Written informed consent of all the participants was obtained and submitted them to Mansoura University (R.22.06.1726). The study protocol conformed to the Helsinki Declaration, the ethical guideline of the World Health Organization for human trials.

Statistical analysis

Data were fed to the computer and analysed using IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. Qualitative data were described using number and percent. Quantitative data were described using median (minimum and maximum) and mean, standard deviation for parametric data after testing normality using Kolmogorov-Smirnov test. Significance of the obtained results was judged at the (0.05) level. Chi-Square test for comparison of 2 or more groups for categorical variables. Student t-test was used to compare 2 independent groups. Paired t test to compare between before and after treatment results.

RESULTS

The mean duration of T2D duration is (12.38 ± 4.37 years). Moreover, the mean age of participants was (66.59 ± 4.36 years) and about 63.8 % of participants were females (Table 1).

Table (1): Sociodemographic Characteristics among patients

	Total number =207	Percentage (%)
Age (Years) (mean ± SD)	66.59±4.36	
-Sex:		
(a) Males	75	36.2 %
(b) Females	132	63.8 %
-Special Habits:		
(a) Non- Smokers	155	74.9 %
(b) Ex- Smokers	26	12.6 %
(c) Current Smokers	26	12.6 %
BMI (kg/m ²) (mean ± SD)	32.23±3.78	
DM duration (years) (mean ± SD)	12.38±4.37	

Table (2): Lines of DM treatment among patients

Drug	Number of Patients	Percentage (%)
Metformin	138	66.7 %
Di- Peptidyl Peptidase- 4 inhibitors (DPP-4i) “Vildagliptin”	116	56.0 %
Sulfonylureas (Glimepiride or Gliclazide MR)	78	37.7 %
Sulfonylureas (Glibenclamide)	12	5.8 %
Sodium Glucose Co Transporter 2 inhibitors (SGLT2i) including Dapagliflozin and Empagliflozin	23	11.1 %
Pioglitazone	22	10.6 %
Glucagon Like Peptide 1 (GLP-1) Agonists	0	0 %
Insulin (Human Premixed)	27	13.0 %
Insulin (Basal Oral Regimen)	10	4.8 %
Insulin (Basal Bolus Regimen)	4	1.9 %

The mean eGFR among the studied group is (74.51 ± 16.92 ml/min), nevertheless, only 11.1 % of the patients on SGLT2i (Table 3).

Table (3): Mean eGFR among patients and categorization according to different stages of renal impairment

eGFR	Number of Patients	Percentage (%)
Mean eGFR (ml/min)	74.51±16.92	
eGFR > 60 ml/min	184	88.8 %
eGFR 45- 59 ml/min	8	3.8 %
eGFR 30-44 ml/min	5	2.4 %
eGFR 15-29 ml/min	10	4.8 %
eGFR < 15 ml/min	0	0 %

The mean HbA1c among the group is (8.34±1.09 gm %). Majority of patients 178 patients (86%) having HbA1c 7.5 gm % and more, while only 29 patients (14%) having HbA1c less than 7.5 gm % (Table 4).

Table (4): Percentage of controlled diabetic patients among studied groups

HbA1c (%)	Total number =207	Percentage (%)
HbA1c (<7.5)	29	14.0 %
HbA1c (≥7.5)	178	86.0 %

Figure (1) shows percentage of patients with HbA1c < 7 % and patients with HbA1c > 7%.

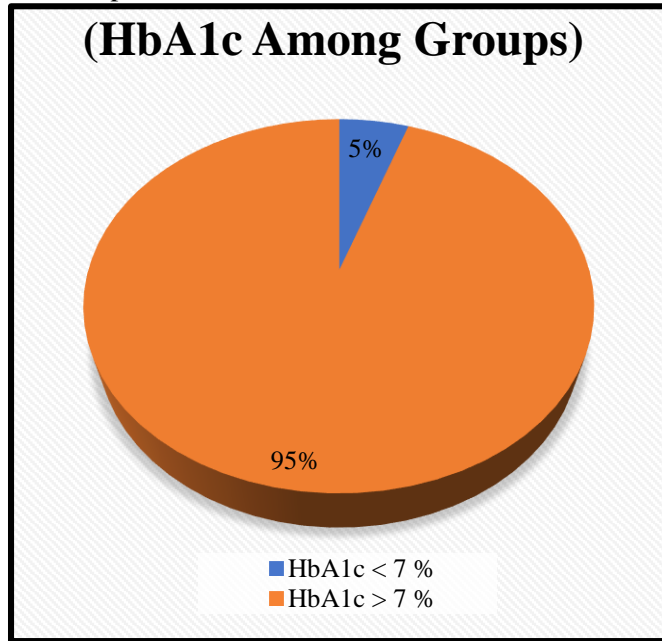


Figure (1): Percentage of patients with HbA1c < 7 % and patients with HbA1c > 7 %.

Among the studied group, 143 patients (69.1%) known to have hypertension and take their anti-hypertensive medications regularly. Nevertheless, only 88 patients (42.5%) are reaching blood pressure less than 140/90-millimetre mercury (mmHg) at time of examination. Moreover, 19 patients (9.2 %) are first discovered to be hypertensive in the study (blood pressure is more than 140/90- mmHg at time of examination and another 3 measures of blood pressure under the basal condition in 3 different days were required from those patients) (Table 5).

Table (5): Prevalence of hypertension among the groups and percentage of patients with controlled hypertension

Parameter	Total number =207	Percentage (%)
-Patient Known to be hypertensive	143	69.1 %
-Patient first discovered hypertension	19	9.2 %
-Normotensive patients	45	21.7 %
-Controlled patients (<140/90 mmHg)	88	42.5 %
-Uncontrolled patients (>140/90 mmHg)	119	57.5 %

Furthermore, only 28 patients (13.5 %) are taking statins regularly. The mean level of low-density lipoprotein (LDL) among the groups is (131.59±30.5 mg/dl). Surprisingly, only 7 patients (3.4 %) reaching LDL less than 70 mg/dl (Table 6).

Table (6): Mean LDL level among the group and percentage of patients with desirable LDL level

Parameter	Total number =207	Percentage (%)
Mean LDL level (+SD)	131.59±30.5 mg/dl	
-Patient use statins Regularly	28	13.5 %
-Patients do not use statins	179	86.5 %
-Patients with LDL < 70 mg/dl	7	3.4 %
-Patients with LDL > 70 mg/dl	200	96.6%

In the well-controlled group, no significant difference regarding the socio-demographic data. However, its noticed that among them better numerical eGFR, blood pressure and LDL level. Lastly, in the well-controlled group, most of patients using oral drugs with lower percentage of sulfonylureas. Moreover, only one patient is using insulin in well-controlled group in comparison to 40 patients in the uncontrolled group (Table 7).

Table (7): Relation between diabetes control (at level 7 %) and socio-demographic, clinical, laboratory findings and treatment lines among studied cases.

	HBA1c (%)		Test of significance
	Controlled (<7) n=11	Uncontrolled (≥7) n=196	
Age (Years)	68.09±3.83	66.52±4.38	t=1.17 p=0.244
-Sex			
(a) Males	3 (27.3 %)	72 (36.7 %)	$\chi^2=0.404$ p=0.525
(b) Females	8 (72.7 %)	124 (63.3 %)	
-Special Habits:			
(a) Non-Smokers	8(72.7)	147(75)	$\chi^2=0.411$ p=0.814
(b) Ex- Smokers	1(9.1)	25(12.8)	
(c) Current Smokers	2(18.2)	24(12.2)	
BMI (kg/m ²)	30.91±3.76	32.30±3.77	t=1.12 p=0.264
DM duration (years)	12.64±4.61	12.36±4.37	t=0.198 p=0.843
Metformin	10 (90.9 %)	128 (65.3 %)	$\chi^2=3.07$ p=0.08
DPP-4i (Vildagliptin)	9 (81.8 %)	107 (54.6 %)	$\chi^2=3.13$ p=0.08
Sulfonylureas (Glimepiride or Gliclazide MR)	5 (45.5 %)	73 (37.2 %)	$\chi^2=0.299$ p=0.585
Sulfonylureas (Glibenclamide)	0	12 (6.1 %)	$\chi^2=0.715$ p=0.398
SGLT2i (Empagliflozin or Dapagliflozin)	2 (18.2 %)	21 (10.7 %)	$\chi^2=0.588$ p=0.443
Pioglitazone	1 (9.1 %)	21 (10.7 %)	$\chi^2=0.029$ p=0.865
Insulin (Human Premixed)	1 (9.1 %)	26 (13.3 %)	$\chi^2=0.160$ p=0.689
Insulin (Basal Oral Regimen)	0	10 (5.1 %)	$\chi^2=0.590$ p=0.443
Insulin (Basal Bolus Regimen)	0	4 (2 %)	$\chi^2_{FET}=0.29$ p=1.0
known Hypertension	6 (54.5 %)	137 (69.9 %)	$\chi^2=1.15$ p=0.284
First Discovered Hypertension	1 (9.1 %)	18 (9.2 %)	$\chi^2=0.0$ p=1.0
Controlled Hypertension (<140/90mmHg)	5 (45.5 %)	83 (42.3 %)	$\chi^2=0.041$ p=0.839
Taking Statins Regularly	2 (18.2 %)	26 (13.3 %)	$\chi^2=0.215$ p=0.643
LDL (mg/dl)	127±31.31	131.86±30.52	t=0.513 p=0.608
eGFR (ml/min)	78.27±15.07	74.30±17.03	t=0.757 p=0.450

t: Student t test, χ^2 =Chi-Square test, FET: Fischer exact test.

P: P value (significant if <0.05)

Parameters described as mean ± SD or as number and percentage

DISCUSSION

DM is state of chronic persistent hyperglycaemia due to defect in insulin secretion from pancreas and/or resistant to insulin receptors at the site of action (target tissue) leading to insulin resistance. This chronic hyperglycaemia is a well-known risk factor that causing damage to the small blood vessels -mainly- in the eye, nerves and kidney (microangiopathy), and it accelerates atherosclerosis in medium sized blood vessels (macroangiopathy). Those complications can be even seen in newly diagnosed patient with DM (3). Prevalence of DM and its associated complications is more common in elderly in comparison to younger patients (4). Management of T2D in elderly should have many parameters like glycaemic control, blood pressure control, weight control and control of lipid profile (5).

Among the studied group, the mean duration of T2D duration was (12.38 ± 4.37 years), moreover, the mean age of our participants was (66.59 ± 4.36 years) and about 63.8 % of our participants were females. One of the characteristic features of the Egyptian elderly population is “feminization”, the sex ratio in Egypt is 83 men for 100 women (6). Furthermore, mean BMI in our participants was (32.23 ± 3.78 Kg/m²), this matches with a study performed in Alexandria and has shown that obesity percentage among free living elderly females is 71.7% (7).

Regarding diabetes treatment, although metformin is listed as a first line of treatment for T2D - unless contraindicated or not tolerated- according to ADA guidelines, only about two thirds of patients were taking it. Metformin was an effective oral antidiabetic drug, low cost, neutral on weight, potential benefits on cardiovascular system and cause no severe hypoglycaemia (8). It is to be noted that in our group, no one has contraindication to metformin, and many patients reported that their physicians did not advise them to take metformin with their current treatment.

About 6 % of our patients took Glibenclamide as an oral antidiabetic drug. Glibenclamide is associated with high incidence of severe hypoglycaemia in elderly and it has a long duration of action and it should be avoided in elderly (9,10).

About 10% of our patients use pioglitazone in their treatment, according to ADA guidelines thiazolidinediones should be used with caution in elderly and in a narrow range because it increases risks of heart failure, macular edema, osteoporosis, fracture and/or

falls (10, 11). It was to be noted that about three patients are taking premixed insulin with pioglitazone, and this would exaggerate the side effects of both drugs. Due to its high cost, no one of our patients was on GLP-1 agonists.

The mean eGFR among the studied group is (74.51 ± 16.92 ml/min), nevertheless, only 11.1 % of the

patients on SGLT2i. According to ADA 2022⁽⁸⁾ those patients should be on SGLT2i -unless contraindicated- as there is a well-established benefit of this class on the decreasing proteinuria and declining in GFR in many major trials. These finding matched with the CAPTURE trial, which was a multinational cross-sectional study conducted on 9823 patients with T2D (their mean age was about 64 years), noticed that SGLT2i was used in 16 % of the patients only, although about 1/3 of patients was eligible for those drugs⁽¹²⁾. Most of countries in CAPTURE trial have good insurance system -unlike Egypt-, nevertheless, similar results were noticed. More education for health care providers should be done about the proper positioning of this class and its benefits in decreasing progression of Diabetic Kidney Disease (DKD).

On the other hand, in the present study 69.1 % of the patients were known to be hypertensive and take their anti-hypertensive medications regularly. However, only 42.5 % of patients have blood pressure < 140/90 mmHg as recommended by many societies^(10,13,14). Our results didn't match with results stated by **Ibrahim et al.**⁽¹⁵⁾ Who reported that only 8% of patients with hypertension were controlled (blood pressure <140/90 mmHg). This would be because their results were published in 2014 and in the last few years the medical knowledge and awareness for hypertension is improved. Moreover, availability of antihypertensive drugs is increased. Our results matched with the CAPTURE trial⁽¹²⁾, which reported that about 70 % of the participants were known to have hypertension. In addition to that, 19 patients (9.2 %) were first discovered to be hypertensive during enrolment in the study. Surprisingly, majority of them reported that blood pressure not measured by their physicians during their regular visits. So, we should confirm on the junior doctors that measurement of blood pressure is essential in every visit even if the patient is asymptomatic.

Another important issue in the management of T2D is control of lipid profile. Ageing and T2D are considered as 2 important risk factors of cardiovascular diseases and a lot of effort should be done to lower LDL level⁽¹⁴⁾. According to guidelines of ADA 2022, LDL level should be -at least- less than 70 mg/dl using moderate to high intensity statins⁽¹⁶⁾. In the conducted study, only 13.5 % of patients were taking statins regularly. The mean LDL level is (131.59 ± 30.5 mg/dl) and only 3.4 % of patients have LDL level less than 70 mg/dl. Similar results have been reported from EUROASPIRE IV trial, which was a large multicentric cross-sectional study conducted in 24 European countries and concluded that among patients with coronary heart disease, 79 % of males and 84% of females have LDL level (≥ 1.8 mmol/L i.e., about 69 mg/dl)⁽¹⁷⁾.

Regarding the control of diabetes, which is the main pillar in management of T2D, according to the recommendations of ADA and American Geriatrics Society^(9,10), the target HbA1c among healthy elderly

with few comorbidities and good functional status was from 7 to 7.5 %. Majority of patients in the current study (86%) having HbA1c 7.5 % and more, while only 5% having HbA1c less than 7 %. These results supported by similar studies conducted in Egypt to assess the glycaemic control. A study conducted in 2019 on 200 Egyptian patients with DM which concluded that only 7 % of patients had HbA1c less than 7 %⁽¹⁸⁾. On the other hand, our results disagree with the results of CAPTURE trial which reported that mean HbA1c among patients was 7.3 %⁽¹²⁾. This difference in the results may be attributed to the difference between socio-economic level and strength of health insurance system in Egypt and countries in the CAPTURE trial. More actions are needed to reduce HbA1c among patients with T2D because the higher HbA1c is associated with higher rates of micro and macrovascular complications⁽³⁾.

Lastly, its noticed that in the well-controlled group, most of patients using oral drugs with lower percentage of sulfonylureas. Moreover, only one patient is using insulin in well-controlled group in comparison to 40 patients in the uncontrolled group. These results agreed with the ADA guidelines that recommends minimizing the use of hypoglycaemic drugs like sulfonylureas and insulin and trying to simplify the insulin regimens as much as possible⁽¹⁰⁾.

CONCLUSION

It could be concluded that there is a large gap between the guideline's recommendation and the situation in real life. This will increase the morbidity and mortality rates among those population and surely will increase the health burden on the health care providers in a developing country like Egypt.

More education is recommended for the doctors about the importance of glycaemic control, blood pressure control and giving statins in appropriate dose to reach the target LDL level as possible. Furthermore, rising the knowledge about the use of drugs with benefit on the kidney and cardiovascular system should be done. Finally, patient awareness about regular screening of diabetes complications and adherence to the medications should be done.

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