

**Original article:**

## **Magnitude and determinants of Diabetes mellitus (DM) and diabetic nephropathy (DN) in patients attending Al-Leith General Hospital**

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### **ABSTRACT:**

**Background:** Diabetes mellitus (DM) is a major public health problem worldwide and is a known risk factor for coronary artery disease (CAD). New recommendations for the diagnosis of diabetes have changed the epidemiology of DM. Therefore, we designed this study with the objective to determine the prevalence of DM type II among patients attending Al-Leith General Hospital of both sexes, between the ages of 20-90 years.

**Objective:** To assess the magnitude of diabetes mellitus (DM) and associated risk factors in Al-Leith area. **Material and methods:** Sociodemographic and anthropometric data were collected by senior clinical nurses. Venous blood was collected from each participant. Serum glucose and lipid profile of the participants were measured.

**Results:** A total 70 patients were studied regarding demographic data and laboratory findings. It was found to be associated more with old age and with man compared to young age and in females, Other associated factors found were sedentary life style, hypertension and hyperlipidemia.

**Conclusion:** It was concluded that the DM type II is associated more with male, old age and sedentary life style and is considered as a risk factor for hypertension, hyperlipidemia, and some autoimmune disease. The long duration of disease has an effect on the levels of blood glucose and electrolytes.

**Keywords:** Type II DM, DN, Prevalence, Enteropathogenesis, Epidemiology

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### **INTRODUCTION**

Diabetes mellitus (DM) is a metabolic disorder characterized by chronic hyperglycemia, resulting from defects in insulin secretion, insulin action or both. <sup>(1-3)</sup> The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels. The disease is associated with significant increased risk of long-term microvascular and macrovascular complications. <sup>(3)</sup> Long-term complications of diabetes include retinopathy with potential loss of vision, nephropathy leading to renal failure, peripheral

neuropathy and autonomic neuropathy. Patients with diabetes have an increased incidence of atherosclerotic cardiovascular, peripheral arterial and cerebrovascular disease.

**AIMS OF THE WORK:**

1. To study prevalence of Diabetes mellitus(DM) and Diabetic neuropathy(DN) among patients attending Al-Leith General Hospital .
2. To analyze the risk factors associated with DM and DN.

**MATERIALS AND METHODS:**

○ **Study area:**

The study was conducted at Al-Leith General Hospital at Alexandria Governate from June till October 2017.

○ **Study population:**

Our study covered all inpatients and outpatients registered in Al-Leith General Hospital including; internal medicine Clinic and Kidney Unit.

○ **Data collection procedures:**

Data was collected using a self-structured questionnaire including sociodemographic, anthropometric (weight, height, BMI) and blood pressure and clinical data along with routine Lab test results.

The height and body weights were measured for each patient using a digital balance with attached height scale. Body mass index (BMI) was calculated as weight in kilograms divided by the square of the height in meters. The BMI was classified into the main category of WHO classification as underweight, normal, overweight, and obese when the BMI is  $<18.5 \text{ kg/m}^2$ ,  $18.5\text{--}24.99 \text{ kg/m}^2$ ,  $25\text{--}29.99 \text{ kg/m}^2$ , and  $\geq 30 \text{ kg/m}^2$ , respectively. <sup>(4)</sup> Noticeably, three blood pressure readings were taken after at least 5 minutes of rest in between them. Patients classified to have either a normal blood pressure if both systolic blood pressure (SBP) and diastolic blood pressure (DBP) are normal or classified as having mild, moderate, and severe hypertension when SBP or DBP was mildly raised, moderately raised, and severely raised, respectively. <sup>(5)</sup>

○ **Blood specimen collection and laboratory analysis:**

About 5 mL of fasting venous blood sample was collected from each patient. Serum glucose, total cholesterol, serum creatinine, albumin, Na, K, BUN and calcium was detected.

○ **Data analysis**

Data from the laboratory investigation, structured questionnaires, and other measurements were coded and entered into SPSS version 21 for analysis.

**RESULTS:**

The results showed that the age of the patient ranged from 22 – 89 years with a mean of 52.54±16.92 years. The male to female ratio was 1:0.84 and the majority of the patients were unemployed (85.0%).

**Table (1):** Demographic data of the studied group.

|                   | Number    | Percent |
|-------------------|-----------|---------|
| Age group         |           |         |
| <30 Y             | 8         | 11.4    |
| 30-50             | 22        | 31.4    |
| >50               | 40        | 57.1    |
| <b>Range</b>      | 22.0-89.0 |         |
| <b>Mean</b>       | 52.54     |         |
| <b>S.D.</b>       | 16.92     |         |
| Sex               |           |         |
| <b>Male</b>       | 38        | 54.3    |
| <b>Female</b>     | 32        | 45.7    |
| Occupation        |           |         |
| <b>Unemployed</b> | 60        | 85.7    |
| <b>Employed</b>   | 3         | 4.3     |
| <b>Retired</b>    | 7         | 10.0    |

**Table (2):** Risk factors and clinical data of the studied group.

|                                    | Number | Percent |
|------------------------------------|--------|---------|
| <b>Smoking</b>                     |        |         |
| No                                 | 64     | 91.4    |
| Yes                                | 6      | 8.6     |
| <b>Previous renal disease (RD)</b> |        |         |
| No                                 | 14     | 20.0    |
| Yes                                | 56     | 80.0    |
| <b>Period DM</b>                   |        |         |
| Less than 5 years                  | 37     | 52.9    |
| Less than 10 years                 | 17     | 24.3    |
| More than 10 years                 | 16     | 22.9    |
| <b>Accommodation</b>               |        |         |
| Urban                              | 7      | 10.0    |
| Rural                              | 63     | 90.0    |

Table (3), represented the distribution of the studied patients regarding incidence of immune disease, it was found that 28 cases (40.0%) had immune disease.

**Table (3):** Distribution of the studied patients regarding the incidence of immune disease.

|                | Number | Percent |
|----------------|--------|---------|
| Immune disease |        |         |
| No             | 42     | 60.0    |
| Yes            | 28     | 40.0    |

Data for the body weight and height expressed as BMI is summarized and represented in Table (4).

**Table (4):** Distribution of the studied group regarding BMI.

|                     | Number | Percent |
|---------------------|--------|---------|
| <b>BMI category</b> |        |         |
| Underweight         | 17     | 24.3    |
| Normal weight       | 29     | 41.4    |
| Overweight          | 11     | 15.7    |
| Obese               | 13     | 18.6    |

Blood pressure and blood lipids levels are expressed in Table (5)

**Table (5):** Distribution of the studied patients regarding to the blood pressure and blood lipids levels.

|                       | Number | Percent |
|-----------------------|--------|---------|
| <b>Blood pressure</b> |        |         |
| Normotensive          | 23     | 32.9    |
| Mild hypertensive     | 25     | 35.7    |
| Moderate hypertensive | 12     | 17.1    |
| Highly hypertensive   | 7      | 10.0    |
| <b>Blood lipid</b>    |        |         |
| Normal                | 42     | 60.0    |
| Hyperlipidemia        | 28     | 40.0    |
| Total                 | 70     | 100.0   |

Table (6) describes the relation between the duration of the disease and FBG, showing that the mean of FBG in the patients with more than 10 years was significantly higher than the other two groups.

**Table (6):** Association between the durations of disease and FBG.

|                  |              |              |              |
|------------------|--------------|--------------|--------------|
|                  |              |              |              |
| <b>FBG</b>       | 77.00-220.00 | 94.00-255.00 | 97.00-315.00 |
| <b>Range</b>     | 135.46±33.50 | 124.94±41.91 | 181.13±74.79 |
| <b>Mean ± SD</b> |              |              |              |
| <b>F</b>         | 6.791        |              |              |
| <b>p</b>         | 0.002*       |              |              |

Table (7) showed the relation between duration of disease and TC, it was found that there was no significant relation between the total cholesterol and the duration of disease, although the level of cholesterol in patients with duration more than 10 years was higher than the other two groups but this increasing was insignificant.

**Table (7):** Relation between duration of disease and TC

|                  |               |               |              |
|------------------|---------------|---------------|--------------|
|                  |               |               |              |
| <b>TC</b>        | 114.00-191.00 | 117.00-239.00 | 61.00-227.00 |
| <b>Range</b>     | 151.95±20.33  | 154.00±31.87  | 163.06±49.60 |
| <b>Mean ± SD</b> |               |               |              |
| <b>F</b>         | .690          |               |              |
| <b>p</b>         | .505          |               |              |

In Table (8), the linkage between the durations of disease and Serum creatinine levels.

**Table (8):** The relationship between the disease durations and Serum creatinine values.

|                         |                          |                           |                           |
|-------------------------|--------------------------|---------------------------|---------------------------|
|                         | <b>Less than 5 years</b> | <b>Less than 10 years</b> | <b>More than 10 years</b> |
| <b>Serum creatinine</b> | 4.90-14.09               | 6.14-13.79                | 5.30-13.20                |
| <b>Range</b>            | 9.68±2.65                | 10.08±2.28                | 10.02±2.63                |
| <b>Mean ± SD</b>        |                          |                           |                           |
| <b>F</b>                | .185                     |                           |                           |
| <b>p</b>                | .832                     |                           |                           |

**Table (9):** The relationship between duration of disease and serum Albumin concentrations.

|                      |           |           |           |
|----------------------|-----------|-----------|-----------|
|                      |           |           |           |
| <b>Serum Albumin</b> | 2.60-8.50 | 2.42-8.40 | 2.90-8.00 |
| <b>Range</b>         | 3.52±1.23 | 3.40±1.33 | 3.59±1.20 |
| <b>Mean ± SD</b>     |           |           |           |
| <b>F</b>             | .108      |           |           |
| <b>p</b>             | .897      |           |           |

In Table (10), the relation between the duration of disease and eGFR was found to be insignificant.

**Table (10):** Relation between the duration of disease and eGFR.

|                  | Less than 5 years | Less than 10 years | More than 10 years |
|------------------|-------------------|--------------------|--------------------|
| <b>eGFR</b>      | 3.00-16.00        | 3.00-6.00          | 4.00-16.00         |
| <b>Range</b>     | 6.22±3.10         | 4.81±1.33          | 6.77±3.32          |
| <b>Mean ± SD</b> |                   |                    |                    |
| <b>F</b>         | 2.189             |                    |                    |
| <b>p</b>         | .120              |                    |                    |

Significant relationship between the duration of the disease and Na levels is represented in Table (11).

**Table (11):** Association between durations of the disease and Na levels.

|                  | Less than 5 years | Less than 10 years | More than 10 years |
|------------------|-------------------|--------------------|--------------------|
| <b>Na</b>        | 131.00-144.00     | 125.00-139.00      | 130.00-139.00      |
| <b>Range</b>     | 137.30±2.92       | 135.59±3.34        | 134.69±3.32        |
| <b>Mean ± SD</b> |                   |                    |                    |
| <b>F</b>         | 4.475             |                    |                    |
| <b>p</b>         | .015*             |                    |                    |

Table (12), showed no significant difference between the duration of disease and K levels.

|                  | Less than 5 years | Less than 10 years | More than 10 years |
|------------------|-------------------|--------------------|--------------------|
| <b>K</b>         | 3.80-6.20         | 4.20-51.00         | 1.10-53.00         |
| <b>Range</b>     | 4.80±0.70         | 7.83±11.14         | 7.69±12.13         |
| <b>Mean ± SD</b> |                   |                    |                    |
| <b>F</b>         | 1.222             |                    |                    |
| <b>p</b>         | .301              |                    |                    |

There were no significance present in the relation between the duration of disease and BUN levels as in Table (13).

**Table (13):** The duration of disease and BUN levels.

|                  | Less than 5 years | Less than 10 years | More than 10 years |
|------------------|-------------------|--------------------|--------------------|
| <b>BUN</b>       | 30.00-86.00       | 50.00-95.00        | 7.50-135.00        |
| <b>Range</b>     | 64.76±13.47       | 73.18±14.68        | 61.94±35.85        |
| <b>Mean ± SD</b> |                   |                    |                    |
| <b>F</b>         | 1.369             |                    |                    |
| <b>p</b>         | .262              |                    |                    |

Table (14), showed no significance difference between the duration of disease and Ca.

**Table (14):** Relation between the duration of disease and Ca levels.

|                  |             |           |             |
|------------------|-------------|-----------|-------------|
|                  |             |           |             |
| <b>Ca</b>        | 6.40-90.00  | 6.20-9.30 | 6.40-66.70  |
| <b>Range</b>     | 12.28±18.85 | 8.09±1.13 | 11.60±14.72 |
| <b>Mean ± SD</b> |             |           |             |
| <b>F</b>         | .437        |           |             |
| <b>p</b>         | .648        |           |             |

A significant association between the duration of disease and the incidence of immune disease was found in our study, shown in Table (15).

**Table (15):** the duration of disease and the presence of immune disease.

|            |            |          |            |          |            |          |       |
|------------|------------|----------|------------|----------|------------|----------|-------|
|            |            |          |            |          |            |          |       |
|            | <b>No.</b> | <b>%</b> | <b>No.</b> | <b>%</b> | <b>No.</b> | <b>%</b> |       |
| <b>No</b>  | 21         | 56.8%    | 14         | 82.4%    | 7          | 43.8%    | 5.462 |
| <b>Yes</b> | 16         | 43.2%    | 3          | 17.6%    | 9          | 56.2%    | .05*  |

Table (16) showed the distribution of the studied patients regarding the treatment drugs, the majority of the patients 92.9% taken other drugs, while 78.9% of the patients taken anti-hypertensive drug, 25 patients taken insulin.

**Table (16):** Distribution of the studied patients regarding the treatment drugs.

|                                 | <b>Number</b> | <b>Percent</b> |
|---------------------------------|---------------|----------------|
| <b>Insulin</b>                  | <b>25</b>     | <b>35.7</b>    |
| <b>Anti-hypertensive drugs</b>  | <b>55</b>     | <b>78.6</b>    |
| <b>Oral hypoglycemic agents</b> | <b>5</b>      | <b>7.1</b>     |
| <b>Lipid lowering drugs</b>     | <b>9</b>      | <b>12.9</b>    |
| <b>Other drugs</b>              | <b>65</b>     | <b>92.9</b>    |
| <b>No treatment</b>             | <b>0</b>      | <b>0.0</b>     |

**DISCUSSION:**

The results of our study showed that the majority of the patients were found in the age group of more than 50 years (57.1%), these results are in agreement with Kirkman MS et al. (6) In our study DM type 2 was found more in male than the females; in the ratio of male: female (1.0:0.84), This change in the gender distribution of type 2 diabetes mellitus is mainly caused by a more sedentary lifestyle particularly among men, resulting in increased obesity. (7)

In our study the majority of the patients (85.7%) were unemployed. Hu and colleagues (8) have shown in their studies the relationship between physical activity and television watching and the incidence of

type 2 diabetes mellitus. In other studies, as well, the sedentary life has been strongly associated with weight gain and obesity.<sup>(8)</sup>

Twenty-eight (40.0%) of our patients had autoimmune disease, many studies have shown that the diabetes may be a risk factor for autoimmune disease, Cervin C et al have shown that the latent autoimmune diabetes in adults (LADA) is often considered a slowly progressing subtype of type 1 diabetes, although the clinical picture more resembles type 2 diabetes. It may be a way to improve classification by studying whether LADA have common genetic features with type 1 and/or type 2 diabetes.<sup>(9)</sup>

In our study it was found that about 25.0% of the patients were underweight, while 41.4% were normal weight, only 18.6% was obese, Redmon et al. have reported weight loss therapies in type 2 diabetic patients which led to a decrease of HbA1c of 0.5%.<sup>(10)</sup> In this study it was found that there was a large number of patients who had hypertension and hyperlipidemia, many study considered type 2 diabetes as a risk factor to increase blood pressure and increased blood lipid profile. In this population-based inception cohort study, diabetes but not hypertension and hyperlipidemia were associated with MI fatality. This emphasizes the importance of diabetes as a cardiovascular risk factor and the need for close surveillance of diabetic patients. Overweight was found to be associated with increased MI fatality.<sup>(11)</sup>

The increase in disease duration was related to many complications, the most complication was the increase in glycosylated hemoglobin and level of blood glucose, in our study it was found that there was a positive significant correlation between the level of blood glucose and the duration of diabetes. David et al, reported that treating diabetes should be simple, to prevent hyperglycemia from causing damage to organs and not to allow hypoglycemia to cause coma as energy supply to brain fails. As glucose fluctuations occur all the time so the effective way is to monitor HbA1c, which gives the average blood glucose level of the preceding 2-3 months.<sup>(12)</sup>

Sodium levels showed a significant decrease by increase in the disease duration, this finding was in agreement with many studies. Electrolyte abnormalities are common in diabetic patients and may be associated with increased morbidity and mortality. These disturbances are particularly common in decompensated DM, in the elderly as well as in the presence of renal impairment. Patients with DM may receive complex drug regimens some of which may be associated with electrolyte disorders. Discontinuation of these medications, when possible, as well as strict control of glycaemia are of paramount importance to prevent electrolyte abnormalities in diabetic patients. The successful management of these disorders can best be accomplished by elucidating the underlying pathophysiologic mechanisms.<sup>(13)</sup>

#### **CONCLUSION:**

Type II Diabetes mellitus was found more in males, old age and those with sedentary life. DM type II is considered as a risk factor for hypertension, hyperlipidemia, and few autoimmune diseases. The long duration of disease had significant effect on blood glucose and electrolytes levels.



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