DIABETIC DISTRESS IN A SAMPLE OF EGYPTIAN DIABETIC ELDERLY PATIENTS

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ABSTRACT:

Background: *DM remains a serious cause of morbidity and mortality. In Egypt, the prevalence of type 2 DM is around 15.6% of all adults aged 20 to 79 years and around 32.4% of elderly population. DM affects not only physical health, but also mental wellbeing as upon diagnosis, patient acquires added responsibilities, planning and self-monitoring to manage DM and reach the desired targeted glycemic control. Diabetes Distress (DD) is the negative psychological reaction related to emotional burdens and worries specific to individual's experience while managing a severe and complicated chronic disease as diabetes. DD is higher in females, having more complications, poor diet and longer diabetic duration. DD is associated with higher levels of HbA1c. DD is different and distinguishable from depression.*

Aim of the study: *to study Diabetic Distress in a sample of Egyptian diabetic elderly patients.*

Patients & Methods: *A Descriptive cross-sectional study on 100 elderly Egyptian diabetic patients aged ≥ 60 years. Full history taking, comprehensive geriatric assessment, DDS17 questionnaire and HbA1c testing were performed for all participants.*

Results: *The total DD among the studied cases was 37%. The most affected domain was regimen distress (54%) followed by emotional distress (28%) then physician distress (26%) and lastly interpersonal distress (25%). DD increase significantly with being female, obesity, non-married, longer diabetic duration, longer hypertension duration, using insulin, having diabetic complications and untreated cataract. It was associated with poor glycemic control as there was a statistically significant correlation between total DD and mean HbA1c.*

Conclusions: *The DD is prevalent among elderly diabetic patients and associated with multiple risk factors which may need further studying.*

Keywords: *Diabetes Distress, Diabetes Mellitus, elderly, Egyptian, DD, DM, HbA1c.*

INTRODUCTION:

Rising geriatric population is a major concern to health economists due to increase health care services budgets and costs that are directed toward them and living with chronic illnesses such as diabetes for many more years **(1&2).** DM is a group of chronic metabolic disorders characterized by abnormalities in insulin secretion, action or both**(3).** It remains a serious cause of morbidity and mortality. Worldwide, The International Diabetes Federation (IDF) estimates around 415 million people (8.8%)

had DM in 2015 and this number is expected to rise to 642 million (10.4%) by 2040. In United States (US), 29.3 million (11%) of the population have diabetes. Additionally, an estimated 35.8 million (13.4%) have impaired glucose tolerance (IGT) and are classified as pre-diabetics. In Egypt, the prevalence of type 2 diabetes mellitus is around 15.6% of all adults aged 20 to 79 years and around 32.4% of elderly population aged above 60 years [4&5].

People with type 2 DM suffer from complications such as cardiovascular disease, nephropathy, retinopathy and neuropathy because of suboptimal control of blood glucose, blood pressure and lipids[6]. DM affects not only individual's physical health, but also his mental wellbeing as upon diagnosis, he acquires added responsibilities, planning and self-monitoring to manage DM and reach the desired targeted glycemic control. Recent systematic reviews have shown depression to be 2–3 times more common in individuals with diabetes than in people without diabetes [7].

Diabetes Distress (DD) is the negative psychological reaction related to emotional burdens and worries specific of having to manage a severe, complicated and demanding chronic disease such as diabetes[8]. The constant behavioral demands (medication dosing, frequency, titration, blood glucose monitoring, food intake, eating patterns and physical activity) of diabetes self- management, progression and complications are directly associated with DD[9]. DD is directly proportionate to diabetes duration which could be explained by progressive increase of micro-vascular complication and insulin treatment[10]. The odds of having DD are higher for being female, previously having depression, experiencing more negative events or more chronic stress, having more complications, and having poor diet and low exercise [11]. It was found that high levels of DD are associated with higher levels of HbA1c due to lower self-efficiency, poorer dietary and exercise behavior and non-compliance to the treatment [12&13]. ADA guidelines suggests that DD should be routinely monitored, assessed and managed if present.

DD has 4 domains: emotional, physician, regimen and interpersonal distress. Screening for DD is by DDS17 questionnaire with considering the patient to have DD if his score is ≥ 2 [14].

Although it's common to overlap DD with Depression, there are many differences between them. Depression is one of the few diagnoses in medicine defined exclusively by symptoms not by cause or disease process. It requires presence of well- defined diverse symptoms (5/9 on DSM-V). When the structured clinical interview (the standard for depression diagnosis) is used, no relationship is found between it, diabetes, diabetes self-management or DD [15].

AIM OF THE STUDY:

To study Diabetic Distress in a sample of Egyptian diabetic elderly patients.

PATIENTS & METHODS:

A descriptive cross-sectional study conducted on a total of 100 elderly Egyptian diabetic patients who presented in inpatient wards and outpatient clinics. All participants were 60 years and over. All seniors presented to the clinic satisfying the inclusion criteria were included until the sample size was satisfied. Those who refuse to participate in the study were excluded.

Clinical assessment:

Patients received full comprehensive geriatric assessment, DDS17 questionnaire and HbA1c testing.

Ethical considerations:

Approval from the ethical committee was obtained from Ain Shams University

and informed consent from all participants. Confidentiality of data was assured. Patients suffering from cognitive impairment were informed and referred to further.

Statistical analysis:

The collected data was coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software version 25.0, IBM Corp., Chicago, USA, 2017 and Microsoft Office Excel 2016.

Descriptive statistics was done for quantitative data as minimum & maximum of the range as well as mean ± SD (standard deviation) for quantitative normally distributed data, while it was done for qualitative data as number and percentage.

Inferential analysis was done for quantitative variables using Shapiro-Wilk test for normality testing, independent t-test in cases of two independent groups with normally distributed data. In qualitative data, inferential analyses for independent variables were done using Kappa test for agreement between paired categorical data. The level of significance was taken at P value < 0.05 is significant, otherwise is non-significant.

Kappa=Observed agreement–chance agreement /1–chance agreement

RESULTS:

The sample of the study was one hundred Egyptian diabetic elderly ≥ 60 years old. 41% of them were males and 59% were females, 60% were married, 67% were overweight and obese, 70% were illiterate, 78% were non smokers, 84% were hypertensive, 21% had ischemic heart disease and 28% had cataract. Their mean age was 69.0±5.9, their mean DM duration was 8.6±3.6 and their mean HbA1c was 8.6±1.6 (Table 1). 69% of patients were treated by insulin, 30% by sulfonylurea, 79% by metformin while 78% by combined therapy. So, most of the patients take metformin with insulin or sulfonylurea. 55% of patients had diabetic complications, in which the most common complication was neuropathy (48%) followed by retinopathy (18%), nephropathy (5%) then diabetic foot (3%) (Table 4).

The prevalence of total DD among the studied cases was 37%. The most affected domain was regimen distress (54%) followed by emotional distress (28%) then physician distress (26%) and lastly interpersonal distress (25%) (Table 2).

The possibility of having DD increased significantly with the following risk factors; being female, obesity, non-married, longer diabetic duration, longer hypertension duration, using insulin, having diabetic complications and untreated cataract (Tables 3 & 4). There was a statistically significant correlation between total DD and mean HbA1c (Table 4). Neurological complications and obesity were significant comorbidities that increased the risk of having total DD. While being married, male and having controlled DM significantly decreased it (Table 5).

Table (1): Demographic characteristics of the studied cases:

		Mean±SD	Range
Age (years)		69.0±5.9	61.0–87.0
DM Duration (years)		8.6±3.6	2.0–20.0
HbA1c		8.6±1.6	5.3–14.0
		N	%
Sex	Male	41	41.0
	Female	59	59.0
Marital status	Single	1	1.0
	Married	60	60.0
	Widow	36	36.0
	Divorced	3	3.0
BMI grades	Normal	33	33.0
	Overweight	46	46.0
	Obese	21	21.0
Literate		30	30.0
Illiterate		70	70.0
Current Smokers		22	22.0
Non-smokers		78	78.0

BMI = Body Mass Index DM= Diabetes Mellitus.

Table (2): Diabetic distress distribution among the studied cases:

Domain		Number	Percentage (%)
Total	Negative	63	63.0
	Moderate	22	22.0
	High	15	15.0
Emotional	Negative	72	72.0
	Moderate	24	24.0
	High	4	4.0
Physician	Negative	74	74.0
	Moderate	22	22.0
	High	4	4.0
Regimen	Negative	46	46.0
	Moderate	30	30.0
	High	24	24.0
Interpersonal	Negative	75	75.0
	Moderate	14	14.0
	High	11	11.0

Total=100 DD= Diabetic Distress. DD: Negative (≤ 2),

Moderate (2–2.9) & High (≥ 3)

Table (3): Relationship between total DD, demographic characteristics and other comorbidities:

		Present (N=37)	Absent (N=63)	p
Age (years)		69.8±6.2	68.5±5.7	^0.287
BMI (kg/m^2)		28.0±4.2	25.8±3.4	^0.005*
Sex	Male	10 (27.0%)	31 (49.2%)	#0.029*
	Female	27 (73.0%)	32 (50.8%)	
Marital status	Married	17 (45.9%)	43 (68.3%)	#0.028*
	Unmarried	20 (54.1%)	20 (31.7%)	
BMI grades	Normal	8 (21.6%)	25 (39.7%)	#0.018*
	Overweight	16 (43.2%)	30 (47.6%)	
	Obese	13 (35.1%)	8 (12.7%)	
Literate		8 (21.6%)	22 (34.9%)	#0.161
Illiterate		29 (78.4%)	41 (65.1%)	
Current Smokers		6 (16.2%)	16 (25.4%)	#0.285
Non-smokers		31 (83.8%)	47 (74.6%)	
Other Comorbidities				
HTN		32 (86.5%)	52 (82.5%)	#0.603
Viral Hepatitis		15 (40.5%)	26 (41.3%)	#0.943
Cataract		15 (40.5%)	13 (20.6%)	0.032*
IHD		11 (29.7%)	10 (15.9%)	#0.100
Hypothyroid		7 (18.9%)	4 (6.3%)	&0.094
AF		4 (10.8%)	4 (6.3%)	&0.463
Hearing impairment		2 (5.4%)	2 (3.2%)	&0.625
HTN duration (years)		10.1±3.3	7.6±4.5	^0.008*

^Independent t-test. #Chi square test &Fisher's Exact test. *Significant **BMI** = Body Mass Index
DD= Diabetic Distress. BMI: Normal (18.5–24.9), Overweight (25–29.9) & Obese (≥30)
HTN= Hypertension **IHD=** Ischemic Heart Disease**AF=** Atrial Fibrillation.

Table (4): Relationship between total DD, DM characteristics and HbA1c:

Characteristics		Present	Absent	p
Duration (years)		10.2±3.0	7.7±3.5	^<0.001*
Treatment	Insulin	32 (86.5%)	37 (58.7%)	#0.004*
	Sulfonyl urea	5 (13.5%)	25 (39.7%)	#0.006*
	Metformin	26 (70.3%)	52 (82.5%)	#0.153
	Combination	26 (70.3%)	51 (81.0%)	#0.220
Coma		12 (32.4%)	12 (19.0%)	#0.130
Neuropathy		25 (67.6%)	23 (36.5%)	#0.003*
Retinopathy		14 (37.8%)	4 (6.3%)	#<0.001*
Nephropathy		4 (10.8%)	1 (1.6%)	&0.061
Diabetic foot		3 (8.1%)	0 (0.0%)	&0.048*
HbA1c		9.2±1.4	8.2±1.6	^0.004*
DM Control	Controlled	5 (13.5%)	23 (36.5%)	#0.013*
	Uncontrolled	32 (86.5%)	40 (63.5%)	

^Independent t-test. §Mann Whitney test. #Chi square test. &Fisher's Exact test. *Significant
Controlled DM: HbA1c ≤ 7.5 in healthy patients with few coexisting comorbidities and 8.0–8.5 in patients with multiple coexisting comorbidities, chronic illnesses, cognitive impairment or functional dependence.

Table (5): Logistic regression for studied factors affecting total distress among the studied cases:

Factors	β	SE	P	OR (95% CI)
Neurological complications	1.59	0.48	0.001*	4.91 (1.90–12.66)
Obese	1.43	0.59	0.015*	4.20 (1.32–13.38)
Males	-1.03	0.53	0.049*	0.36 (0.13–1.02)
Married	-1.36	0.46	0.003*	0.26 (0.10–0.63)
Having Controlled DM	-2.03	0.62	0.001*	0.13 (0.04–0.44)

β: Regression coefficient, SE: Standard error, OR: Odds ratio, CI: Confidence interval, *significant

DISCUSSION:

The total DD among the studied cases was 37%. The current study was appeared to be in the average range of the global parentage as various studies have been conducted around the world. Comparable findings was recorded as 39% in Canada, 42.5% in China, 44 % in South Africa, 36.8% in Ethiopia and 41.5% in USA[16, 17, 18, 19, 9].

Lower occurrence of DD among cases was recorded in 25% in Saudi Arabia, 12.5% in Vietnam due to younger age of the patients as 75% of them are < 60 years old and 8.9% in Thailand as the cases were from a primary health care center where patients are known to have better health status [20, 21, 22]. While higher distribution of DD among cases were recorded in India (53%) as the cases were from a rural tertiary hospital, 52% in Nigeria, 87.6 % in Sudan and 67.5% in Iran[23, 24, 25, 26].

In our study, the most affected domain was regimen distress (54%) followed by emotional distress (28%) then physician distress (26%) and lastly interpersonal distress (25%). In accordance with our study, *Parsa S. et al.* in Iran found that the most affected domain was regimen distress (75.5%) followed by emotional distress (74.1%) then physician distress (64.1%) and lastly interpersonal distress (50.9%)[27]. While *Aljuaid et al.* in Saudi Arabia demonstrated that the most affected domain was emotional distress (54%) followed by physician distress (24.9%) then regimen distress (12.7%) and lastly interpersonal distress (7.7%) [20].

We can notice the difference in DD due to different socioeconomic state, conditions of living and health care services in different countries. The higher the socioeconomic state and health care services the lower the prevalence of DD and vice versa. In Saudi Arabia, it was conducted on cases from Prince Mansour Military Hospital in which there is higher socioeconomic status and higher level of health care facility resulting in lower distribution of DD [20]. While lower socioeconomic state, the lack of organized diabetes care and well-trained staff in diabetes management due to political instability in Sudan or near total economic embargo in Iran resulted in higher distribution of DD [25,26]. Also, we included only elderly patients, while these studies included patients of different age groups. Also, inclusion of type 1 DM patients who has markedly higher DD than type 2 DM in Nigeria and Iran resulted in higher distribution of DD [24, 26].

In our study, the females were 59% of the patients. There was a significant positive relationship between sex and Total DD score with P-value 0.029 (DD was more in female patients than male patients) as 73% of the patients with DD were females. This may be explained by increased comorbidities, disabilities and emotional instability in females [28]. This agrees with *Pandit et al.* who found that female patients had highly significant positive relationship with Diabetes Distress score (P-value <0.001) [9].

While in *Tunsuchart et al.,* DD was not significantly correlated with the gender of the patient with P-value of 0.374 [22].

We found that 67% of the cases were overweight and obese. There was a statistically significant positive relationship between BMI and Total DDS score with P-value 0.005. In accordance, *Azadbakht et al.* found that high BMI associated with high diabetes distress in type 2 diabetic patients with P-value of 0.025 [29]. The same as *Niroomand et al.* and *Aljuaid et al.* who found a statistically significant positive relationship between BMI and Total DDS with P-value less than 0.001 for both[26, 20]. This may be explained by increase comorbidities and complications in obese patient, criticism about losing weight and stress from weight reduction maneuvers as dieting, physical activity and preventive behavior as stated by **ADA** (American Diabetic Association) guidelines 2022 [3]**.** On the other hand, *Geleta et al.* stated that BMI wasn't significantly related to DD with a P-value of 0.054. This could be explained as most of their patients (64%) had normal BMI [19].

In our study, being unmarried increased the risk of developing DD with a P-value of 0.028 as 54% of the patients with DD were unmarried. This may be explained by loss of spousal and family support and having to manage DM, its complications, management, drug intake and hospital visits for follow up alone[30]**.** This agrees with *Ramkisson, S. et al.* who showed that Being unmarried increased the risk of developing DD with a P-value less than 0.001[18].
On the other hand, *Aljuaid et al.* also stated the same with a P-value of 0.19[20]. This might be due to high socioeconomic status in Saudi Arabia, use of maids and lack of variability of marital status among the participating patients (94% of the cases were married).

Interestingly, there was a controversy regarding relationship between DD and DM duration. Our study found a statistically significant positive correlation between DD and duration of DM with a P value less than 0.001. The longer the duration of DM, the higher the incidence of developing DD. This may be explained by increase complications and the need of adding insulin to treatment regimen. This agrees with *Islam MR et al.* and *Zhou H. et al.* who established a statistically significant positive correlation between DD and duration of DM with a P value less than 0.001 for both [31, 17].
While *Azadbakht et al.* stated that DD is higher in patients with less than 10 years of disease duration [29]. They explained this to the process of adjustment to the disease, learning disease management skills, and increasing patients' awareness of the disease[32]**.** The longer the duration of DM, the higher the skills, knowledge and awareness of the patient of his disease, medications and complications resulting in better attitude and management of diabetes which leads to less DD.

On the other hand, *Mirghani, HO* and *Niroomand et al.* demonstrated the DD and duration of DM are not related to each other with a P value of 0.3 for both [25, 26]. This can be explained in *Mirghani, HO* by the high prevalence of DD that affected most of the cases (87%) which neutralized the effect of DM duration on DD [25]. While *Niroomand et al.*, included patients with type 1 DM that has different management and affecting factors from type 2 DM [26].

Regarding diabetic medications, we found a statistically significant relationship between taking insulin or sulfonylurea and developing DD with P values 0.004 and 0.006 respectively. This agrees with *Huynh, G.* with a P value of 0.012[33]. Zhou et al. explained this as patients needed to spend more energy and had higher medical expenses, which could cause greater distress[17]. These drugs cause hypoglycemia which may increase DD. Also, patients treated by insulin have many difficulties

regarding adjustment of the dose and the need of multiple injections. On the other hand, *Azadbakht et al.* stated that there is no statistically significant relationship between diabetic medications and DD with a P value of 0.8 [29]. They mentioned that their study didn't gather information regarding DM control, HbA1c and drug compliance which may lead to this finding.

As expected, the presence of diabetic complication increased the incidence of DD in our study. This agrees with *Azadbakht et al.* and *Niroomand et al.* who established a statistically significant positive correlation between DD and diabetic complications with P value of less than 0.001 for both [29, 26]. This may be due to increase fear and feeling overwhelmed about managing the demands of DM and its complications, fearing progression of the complications and the recurrent request and criticism of the treating physicians regarding DM control. While in *Tunsuchart K. et al.* and *Chew, B. et al.*, there was a non-significant statistical relationship between diabetic complication and DD with P value of 0.44 [22, 34]. They explained that by the lack of variability of DM complications among the participating patients (affected 85% of the cases in *Tunsuchart K. et al.)* which could negate the effect of DM complications on DD [22]. Also, the diversity in prevalence of diabetic complications in different communities may have a role which may need further studying.

Regarding other comorbidities, we found that Hypertension was the most common comorbidity (84% of patients). There was a statistically significant relationship between hypertension duration and DD with a P value of 0.008. While there was no statistically significant relationship between hypertension duration and DD in *Onyenekwe, B. M. et al.* with a P value of 0.42[24]. This could be explained by including patients with type 1 DM in their study who has high values of DD and less occurrence of hypertension compared to patients with type 2 DM.

We also found a statistically significant relationship between cataract and DD with a P value of 0.032. Other studies didn't mention cataract as a risk factor in their studies. This may be due late diagnosis and treatment in Egypt, increase visual problems as retinopathy and fear of surgical interference which delay treatment.

The mean HbA1c of the cases in our study was 8.6. As expected, there was a statistically significant correlation between total DD and mean HbA1c with a P value of 0.004. This may be explained by increased unhealthy habits causing uncontrolled DM as obesity, physical inactivity, dietary pattern of high glycemic index particularly white bread and polished rice. They rarely change their eating or exercise habits after a diabetes diagnosis, no routine daily glucose monitoring, no follow-up, poor adherence to drugs and they visit governmental health care centers to get their medications for free or for a small fee, but not for regular evaluation[4]**.** All of this greatly increase HbA1c and DD. This agrees with *Parsa S. et al.* found a statistically significant correlation between total DD and mean HbA1c with a P value of less than 0.001 [27]. In accordance, *Aljuaid et al.* and *Tunsuchart K. et al.* had stated that there was a statistically significant correlation between total DD and mean HbA1c with a P value of 0.012 for both [20, 22].

On the other hand, *Nguyen et al.* disagree with our study and found no statistically significant correlation between total DD and mean HbA1c with a P value of 0.15 due to lower total DD and HbA1c value in their cases and most of their cases weren't elderly patients (75% of them are < 60 years old)[21]. Also, *Mirghani HO* found no statistically significant correlation between total DD and mean HbA1c with a P value of 0.1[25]. This may be due to the high prevalence of DD that affected most of the

cases (87%) which could negate the effect of HbA1c on DD.

Conclusion:

The study found that the total DD among the studied cases was 37% which appeared to be in the average range of the global parentage. The most affected domain was regimen distress (54%) followed by emotional distress (28%) then physician distress (26%) and lastly interpersonal distress (25%).

The possibility of having DD increased significantly with the following risk factors; being female, obesity, non-married, longer diabetic duration, longer hypertension duration, using insulin, having diabetic complications and untreated cataract. Patients having these risk factors are advised to be screened for DD especially if their diabetic state is uncontrolled. If they have DD, identifying the affected domain with applying appropriate measures to correct their state.

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التوتر السكري في عينة من مرضي البول السكري المصريين المسنين

المقدمة: يظل البول السكري سببا خطيرا للاعتلال والوفيات. يصيب داء البول السكري النوع الثاني حوالي ١٥،٦% من جميع البالغين الذين تتراوح أعمارهم بين ٢٠ و٧٩ سنة وحوالي ٣٢،٤% من السكان المسنين في مصر. وهو لا يؤثر على الصحة البدنية للمريض فحسب، بل أيضاً على الرفاهية العقلية له. فعند التشخيص بالإصابة به يكتسب المريض مسؤوليات إضافية من الالتزام بالمتابعة والتخطيط لضبط السكر والوصول إلى نسب السكر بلدم المرجوة. إن التوتر السكري هو رد الفعل النفسي السلبي المتعلق بالأعباء العاطفية الخاصة بتجربة الفرد عند التعامل مع مرض مزمن ومعقد كمرض السكري. ويرتفع معدل الإصابة بالتوتر السكري عند الإناث، مع وجود المزيد من المضاعفات، اتباع أنظمة غذائية خاطئة، وطول مدة الإصابة بالسكري. ويرتبط التوتر السكري بارتفاع نسبة السكر التراكمي. وهو مختلف ويمكن تمييزه عن الاكتئاب.

الهدف من الدراسة: دراسة التوتر السكري في عينة من مرضي البول السكري المصريين المسنين.

المرضى وطرق الدراسة: دراسة وصفية تداخلية على ١٠٠ من المرضي كبار السن ممن يبلغون من العمر ٦٠ عاما فأكثر. تم الحصول على التاريخ المرضي وعمل استبيان التوتر السكري وعمل تحليل السكر التراكمي لهم.

النتائج: وجدت الدراسة ان معدل التوتر السكري الكلي في الحالات يبلغ ٣٧%. كان التوتر السكري العلاجي هو الأكثر شيوعاً بنسبة ٥٤% متبوعاً بالتوار السكرى العاطفي بنسبة ٢٨% ثم التوتر السكرى الطبي بنسبة ٢٦% وأخيراً التوتر السكري العائلي بنسبة ٢٥%. تزداد احتمالية وجود التوتر السكرى بوجود الفئات الآتية: النساء، البدناء، غير المتزوجين، مستخدمي الانسولين، المصابين بالسكر وارتفاع ضغط الدم لفترات طويلة، المصابين بمضاعفات مرض السكر ومرضي المياه البيضاء بالعينين. وجدت الدراسة ان هناك دلالة إحصائية كبيرة بين التوتر السكرى الكلي ومتوسط تحليل السكر التراكمي.

الاستنتاج: ينتشر التوتر السكرى بين كبار السن المصابين بالسكري ويرتبط بعوامل خطر متعددة قد تحتاج إلى مزيد من الدراسة.