

A Study of Healthcare Provided to Diabetic Patients During the Syrian Crisis in Damascus (Health Awareness, Drug Therapy, Therapeutic Follow-up)

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Abstract**Background**

This study aims to assess the level of health care for patients with diabetes in Damascus during the Syrian crisis by studying the level of health awareness and its relationship to the levels of Hemoglobin A1c, and studying the availability of drug therapy and the quality of treatment follow-up provided for patients.

Methods and materials

A descriptive cross-sectional study, that used a paper questionnaire filled out by means of a mini interview, the sample was selected from patients with diabetes who were in the outpatient department of Damascus Hospital and the endocrinology clinic at the Martyr Bassam Abboud Medical Center.

Results

The study included 385 patients (56.6% males and 43.4% females) and 48.05% of the participants were in the age group of 40-60 years. The level of health awareness among patients was good, especially with regard to information about the role of diet and exercise in diabetes, knowledge of interpreting the results of blood sugar tests and methods to prevent hyperglycemia and hypoglycemia attacks. No relationship was found between the high level of health awareness and decreased values of Hemoglobin A1C in the participants. 74.3% of the participants expressed that they do not face difficulties in order to acquire treatment, as they used to get it for free from health centers. The majority of patients checked their blood sugar level continuously and checked the levels of Hemoglobin A1c, kidney function tests, lipids and cholesterol levels periodically.

Conclusion

The level of health awareness for diabetic patients in Damascus is generally average, and there are no difficulties in securing treatment for the majority of patients, and the therapeutic follow-up of the disease was at a high level, as laboratory tests required for diabetes are carried out periodically and regularly.

Keywords: Hyperglycemia, Hypoglycemia, Diabetes Mellitus, Health Education, Damascus.

Introduction

Approximately 537 million adults (20-79 years) are living with diabetes worldwide, and this number is projected to rise to 643 million by 2030 and 783 million by 2045 [1]. In 2021, diabetes mellitus (DM) caused 6.7 Million deaths making it one of the largest global health emergencies of the 21st century [1]. This concerns medical field especially in our region as 3 in 4 adults with diabetes live in low- and middle-income countries [1]. It was found

that DM patients tend to present at a younger age or with more advanced disease and disease complications in these countries [2]. This can be due to inadequate healthcare access and insufficient laboratory testing, medication availability, health awareness and limited self-management of patients [3]. There are many complications of DM, such as diabetic retinopathy and diabetic nephropathy, that can lead to blindness and kidney failure [4, 5].

In addition, DM increases the risk of cardiovascular disease, the leading cause of mortality and morbidity among patients with type 2 DM, which due to higher rates of smoking, and less access to cardiovascular risk assessment and management is more common in developing countries [6–12]. As the majority of diabetes is type 2, which generally follows a period of prediabetes, a condition where blood glucose levels are higher than normal, but not high enough for a type 2 diabetes diagnosis, most DM cases are avoidable or can be delayed. This makes early detection and treatment the best choice to prevent disease progression and complications [13].

So, based on IDF's theme of year 2021 (Access to Diabetes Care: If not Now than When?), we will try to take a simple glimpse of the health status of DM patients visiting health centers in Damascus, their education and awareness, how are they monitored and treated? And whether or not they have access to all medications and tests needed.

Methods

Our cross-sectional study aims to assess the level of health awareness among patients with diabetes in Damascus according to their different educational levels and its relationship to patients' levels of HbA1c during the Syrian crisis. It aims to study the availability of diabetic medications according to their type and its relationship to episodes of hyperglycemia, and also to assess the quality of therapeutic follow-up.

Inclusion Criteria

Any patient with type 1 or type 2 diabetes coming to the outpatient department at Damascus Hospital or the endocrinology clinic at the Martyr Bassam Abboud Center.

Exclusion criteria

Patients who come to the outpatient department at Al-Mujtahid Hospital in a case of severe or explicit and clear complications of diabetes, and patients who visit the endocrinology clinic at the Martyr Bassam Abboud Center for glandular reasons other than diabetes or its complications.

Instrumentation and Procedure

The study was conducted in a descriptive cross-sectional design, between 1.5.2022 and 5.7.2022 after obtaining ethical approval. Questionnaires were filled out by means of mini-Interviews after obtaining the approval of the hospital and medical center director. The information required for the study was collected, then specially designed forms were filled out with the collected data.

Data Analysis

The variables and data were entered and encoded in Excel, and then entered and decoded in SPSS-26 to analyze relationships, graphs, and statistical tables through it the relationship between qualitative and demographic variables was studied using chi-square test.

Ethical considerations

Ethical approval was obtained from the Institutional Review

Board (IRB) Faculty of Medicine, Syrian Private University, and the Damascus Hospital Institutional Review Board (IRB). Verbal consent was obtained from each patient when contacting them for data collection purposes.

Results

Demographics

Our sample included 385 participants, with males being 56.6% (N=218) and females being 43.4 (N=167). The difference between males and females is small and doesn't relate any significance.

Regarding Age, the largest proportion of our sample were in the age group of 40-60 years (48.05%) followed by the age group >60 years (40.0%) (figure1).

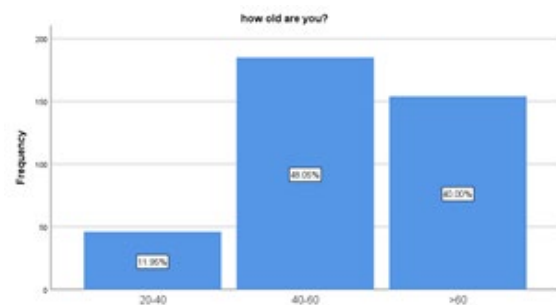


Figure 1: Age distribution of the sample

The level of education of the participants was low with 37.92% of our sample getting primary education and 35.58% being uneducated. And the proportion of the sample who got high-school education was low 12.73%. (figure2)

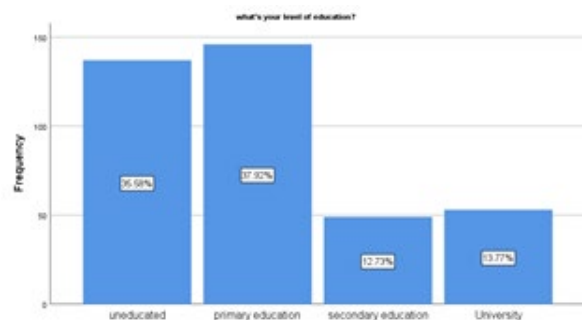


Figure2: Sample distribution according to education

The percentage of participants who worked in manual, industrial or mechanical crafts was the largest 38.44%, followed by participants without work with 30.39%, then participants with office work by 19.74%. The lowest percentage of participants was for those working in the education field (1.04%). While 10.39% of the participants stated that they work in fields other than those mentioned.

Only 11.43% of the participants had health insurance that covered

the treatment expenses. However, 88.57% indicated that they do not have health insurance.

The percentage of non-smokers was 50.91%, while the percentage of smokers was 49.09%. By asking about the duration of smoking, 36.88% of the participants reported that they had smoked for more than 10 years, while 7.79% reported that they had smoked from 5 to 10 years, and the least proportion 4.42% was for those who smoked for less than 5 years.

The distribution of the participants regarding their type of diabetes was in favor of type 2 Diabetes Mellitus with 83.4% (N=321) of the participants having T2DM.

Regarding the duration of the disease, 69.61% of the participants had diabetes for more than 10 years, and 16.36% had it from 5 to 10 years, while the lowest percentage was for patients with diabetes for less than 5 years (14.03%).

When asking about the family history of diabetes, the percentage of patients with a diabetic patient in the family was 75.58%, and the percentage of patients who do not have a family history of diabetes was 24.42%.

Health awareness

Assessment of the level of health education about diabetes among the participants was done using self-assessment by giving a score from 1 to 5 when answering questions about topics related to diabetes.

The self-assessment showed that the largest percentage of the participants had good knowledge about the role of diet in diabetes, as 42.9% of the participants estimated that they got a score of 3 out of 5 and 32.2% of the participants had a score of 2 out of 5. While the percentage of participants who reported a knowledge of an excellent rating with a score of 4 out of 5 and 5 out of 5 was 12.7% and 6.2%, respectively. The lowest percentage (6.0%) was for those who gave themselves a poor rating of 1 out of 5. (table1, Fig3)

In terms of knowledge about the role of physical exercise in diabetes, the percentage of participants with a score of 2 out of 5 was 32.5%, followed by participants with a score of 3 out of 5

(28.8%). The percentage of participants with a score of 4 out of 5 was 16.9%, and a score of 5 out of 5, which is the lowest, was 7.3%. The percentage of participants with a score of 1 out of 5 was 14.5%. (table1, Fig3)

In assessing knowledge about the medications that patients take, the largest percentage was 36.9% for a score of 1 out of 5 and the lowest percentage was 4.2% for a score of 4 out of 5, which implicates a poor knowledge regarding this topic. (table1, Fig3)

Knowledge about reading blood glucose test results was excellent, at 57.9% of participants with a score of 4 out of 5 and 7.3% with a score of 5 out of 5. While the score of 1 out of 5 and 2 out of 5 was lower, with 11.2% and 19.0%, respectively. (table1, Fig3)

Assessing knowledge about the prevention and treatment of hyperglycemia and hypoglycemia attacks revealed a high awareness level which showed that 9.9% of the participants got a score of 1 out of 5 and 8.3% got a score of 2 out of 5. While the score of 3 out of 5 and 4 out of 5 was 30.1% and 33.0%, respectively. The percentage of participants who got a rating of 5 out of 5 was 18.7%. (table1, Fig3)

Regarding the level of knowledge about avoiding long-term complications of diabetes, the largest percentage was 37.9% for participants with a score of 2 out of 5 and the lowest percentage, 4.2% was for participants with a score of 5 out of 5. (table1, Fig3)

Knowledge about foot care in diabetic patients was good, with a score of 1 out of 5 and 2 out of 5, of 12.2% and 7.8%, respectively. The score of 3 out of 5 was the largest, with 37.7%. While the score of 4 out of 5 and 5 out of 5 was 26.8% and 15.6%, respectively. (table1, Fig3)

The assessment of knowledge about pregnancy and diabetes was poor, with 68.3% of participants with a score of 1 out of 5 and 25.5% with a score of 2 out of 5, while the score of 3 out of 5 and 4 out of 5 were equal (1.0%), which is the lowest percentage. (table1, Fig3)

Table 1: Self-assessment of health awareness

Health awareness	1	2	3	4	5
How do you rate your knowledge about the role of diet in diabetes?	6.0%	32.2%	42.9%	12.7%	6.2%
How do you rate your knowledge about the role of physical exercise in diabetes?	14.5%	32.5%	28.8%	16.9%	7.3%
How do you rate your knowledge about the drugs you're taking	36.9%	35.3%	16.4%	4.2%	7.3%
How do you rate your knowledge about reading blood glucose measurements?	11.2%	19.0%	4.9%	57.9%	7.0%
How do you rate your knowledge preventing and treating hyperglycemia and hypoglycemia attacks?	9.9%	8.3%	30.1%	33.0%	18.7%
How do you rate your knowledge about the prevention of long-term complications of diabetes?	23.1%	37.9%	18.2%	16.6%	4.2%
How do you rate your knowledge foot care?	12.2%	7.8%	37.7%	26.8%	15.6%
How do you rate your knowledge about diabetes and pregnancy?	68.3%	25.5%	1.0%	1.0%	4.2%

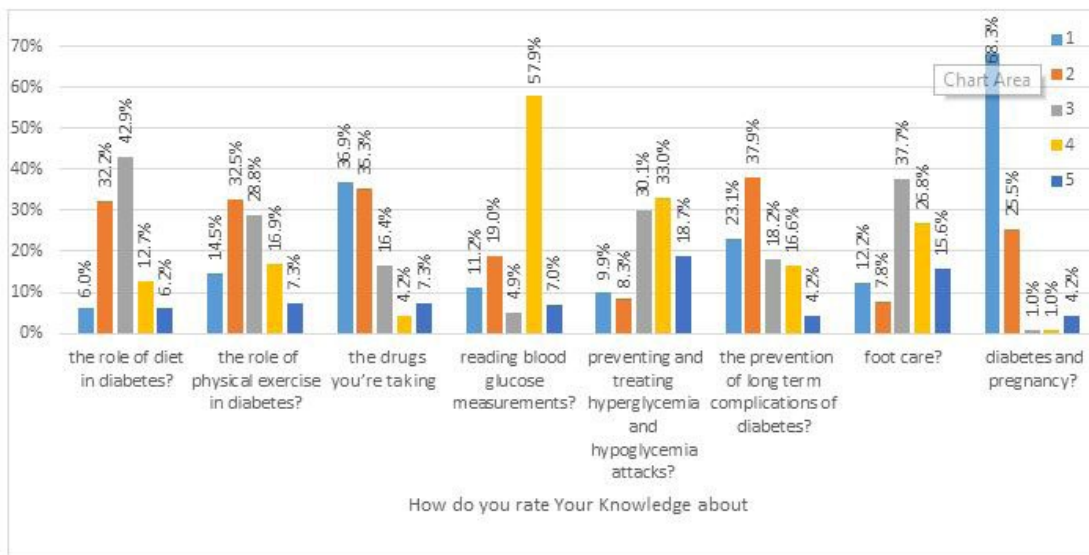


Figure 3: Percentage of self-assessment of knowledge

Data analysis showed that the higher the level of education a diabetic patient gets, the higher the levels of health awareness about diabetes they have. The scores obtained by the participants from question 11 were collected and the average was calculated (the sum equals 40 points). The average score of the uneducated participants was 19.3, the average score of the participants with primary

education was 21.3 and those with secondary education were 24.5, and the average score of participants with university-level education was 27.3. ANOVA test was done, and it confirms the existence of a statistically significant relationship between the variables where the p-value was less than 0.05. (Table 2)

Table 2: Relation of education level with health awareness levels

ANOVA					
total sum					
Sum of Squares	Df	Mean Square	F	Sig.	
Between Groups	2456.702	3	818.901	28.381	.000
Within Groups	10993.262	381	28854		
Total	13449.964	384			

With regard to the relationship between the level of health awareness and the level of hemoglobin A1c. It was not found that the high levels of the total marks of question 11 (which indicates the level of awareness) was associated with lower levels of HbA1c, where the average marks of the participants with HbA1c levels under 6.5 was 19.7 out of 40, while the average marks of the participants with HbA1c levels between 6.5 and 7.9 was 15.14 out of 40. The mean score of patients with HbA1c levels over 8.0 was

23.1 out of 40 (which is higher than the mean of the participants with a HbA1c level of <6.5), which suggests that there are other factors related to the improvement of HbA1c levels other than health awareness, such as the adherence to drug therapy, and the regularity of laboratory follow up as well as dietary and physical practices. However, these values are not statistically significant as the P-value was greater than 0.05. (Table 3)

Table 3: Relation of HbA1c levels with health awareness levels

ANOVA					
total sum					
Sum of Squares	Df	Mean Square	F	Sig.	
Between Groups	209.689	3	69.896	2.011	.112
Within Groups	13240.274	381	34.751		
Total	13449.964	384			

Drug therapy

When asked about the type of treatment used by the participants, the number of patients who used glucose-lowering drugs was 227 patients (59.0%), while the number of patients who used insulin was 88 patients (22.9%). And 80 patients (18.2%) indicated that they use insulin in addition to glucose lowering drugs.

When asked about the knowledge of the side effects of the medications that patients take, the percentage of patients who did not know the side effects of their medications was the largest (60.5%), and the percentage of patients who knew the side effects of their medications was 39.48%.

The percentage of patients who knew how to self-inject insulin was 53.51%, while the percentage of patients who did not know how to self-inject insulin was 46.49%.

Regarding facing difficulties in acquiring treatment, 74.3% of patients indicated that they do not face any difficulties in securing treatment, while 24.7% indicated that they suffer from the high cost of medication.

Data analysis showed that there is a relationship between taking glucose lowering drugs and an increase in the knowledge of side effects, as the percentage of participants who know the side effects of their medications was the largest among the participants who use glucose-lowering drugs (57.6%), but this relationship is not statistically significant because the P-value was greater than 0.05. (Table 4)

Table 4: Relation between medications used and knowledge of side effects

Type of treatment and side effect knowledge		Do you know the side effects of your medication?		Total	Chi-Square	p.value
		Yes	No			
What is the medication you use?	Insulin	42	46	88	3.337 ^a	.189
	Glucose-lowering drugs	83	144	227		
	Insulin + glucose-lowering drugs	27	43	70		
Total		152	233	385		

The largest proportion of the participants (35.2%) who faced the difficulty of high cost in securing their medication was among the patients who used glucose-lowering drugs which suggests that there is a relationship between having a difficulty of high cost with the use of glucose-lowering drugs, and these values are statistically significant as were (P-value<0.05). (table 5)

Table 5: Relationship between high cost difficulty with type of medication

Difficulty in obtaining medication and type of medication		Difficulty in obtaining medication			Total	p.value
		High cost	Not available in pharmacies	don't face difficulties		
Used medication	Insulin	0	0	88	88	0.031
	Glucose-lowering drugs	80	4	143	227	
	Insulin + glucose-lowering drugs	15	0	55	70	
Total	95	4	286	385		

One-Sample Test						
	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
What is the medication you use?	59.908	384	.000	1.95325	1.8891	2.0174
What's the difficulty you face in obtaining medication	56.727	384	.000	2.49610	2.4096	2.5826

It is relevant from (Table 6) that most patients did not face difficulties in acquiring treatment, despite this, 180 patients reported suffering from hyperglycemia attacks more than 6 times during the past year, which indicates that there are other factors involved in the development of hyperglycemia attacks other than the lack

of medication, such as problems with adherence to therapy (like patient neglect or forgetfulness to take medications on time) or problems with eating habits, and by conducting an ANOVA test, the P-value was found to be greater than 0.05 which indicates that this relationship is not statistically significant.

Table 6: Difficulty in obtaining medication and hyperglycemia attacks

Difficulty in obtaining medication and hyperglycemia attacks		Hyperglycemia attack				Total
		None	1-3 times	4-6 times	More than 6 times	
Difficulty in obtaining medication	High cost	7	15	12	61	95
	Not available in pharmacies	0	0	0	4	4
	don't face difficulties	31	27	48	180	286
Total		38	42	60	245	385

ANOVA					
Difficulty in obtaining medication					
Sum of Squares	Df	Mean Square	F	Sig.	
Between Groups	3.231	3	1.077	1.450	.228
Within Groups	283.014	381	.743		
Total	286.244	384			

Therapeutic follow-up

Information was taken about the methods used by patients to measure the blood sugar levels and the approximate number of times the glucose level was measured. They were also asked about the presence of a blood glucose meter at home and the number of test strips used per week. Also, a question was asked regarding the reasons for not measuring blood sugar level continuously.

The number of patients using blood glucose test strips at home was the largest with 59.74% (230 patients). While the number of patients using blood or urine tests at the doctor's office was only 151 patients, or 39.22%.

228 (59.22%) patients reported that they measure their blood sugar

level once a week or less, and 133 patients (34.55%) reported that they measure 2-6 times a week. While the lowest percentage was for those who measure once or more per day (12 patients 3.12%).

59.48% of patients indicated that they own a blood glucose meter at home, and the number of patients who used less than 3 test strips per week was 179 patients (46.5%), which is the largest number, while the number of patients who used 3 to 6 strips per week was

46 patients (11.9%) and the number of patients who use more than 6 strips per week is 8 patients (2.1%).

Moving on to the reasons of not measuring blood sugar levels continuously, the high cost and lack of measurement methods were the most common reasons with 47.3% and 43.1%, respectively, and (Table 7) shows the percentages of other reasons.

Table7: causes of not measuring glucose levels

Causes of not measuring glucose levels	Frequency	Valid Percent
Forgetfulness	13	3.4
Not convinced of its benefits	4	1.0
Time/place inappropriate	4	1.0
Out of measuring tools	166	43.1
High cost	182	47.3
Results don't change frequently	16	4.2
Total	385	100.0

Participants were also asked about doing laboratory tests such as HbA1c levels, kidney function test, lipid and cholesterol levels, in addition to asking about doctor visits for diabetes, foot exams, funduscopy, and blood pressure measurements.

As for the levels of HbA1c, the percentage of patients who measured HbA1c levels within the past six months and reported the result was 44.7% (172 patients), and the percentage of those who did not measure was 37.9% (146 patients). While the percentage of patients who did the measurement but did not remember the result was 17.4% (67 patients). The HbA1c levels of the participants who tested and reported the result were below 6.5 in 18 patients (10.46%) and between 6.5 and 7.9 in 101 patients (58.72%), and the number of patients who had a HbA1c level of more than 8.0 was 53 patients (30.81%).

Moving to the number of doctor visits for diabetes, the largest percentage (64.94%) was for patients who visited the doctor 5 or more times annually, while the lowest percentage (1.04%) was for those who visited the doctor once every 5 years.) Figure 4)

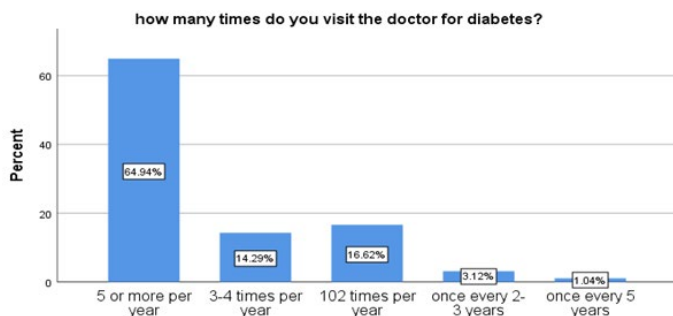


Figure 4: doctor visits frequency

Regarding foot examination, funduscopy, kidney function tests, and lipid and cholesterol levels, the percentage of patients who got their foot examined by a doctor during the past year was 19.2%, and the percentage of patients who have undergone funduscopy during the past year was 58.7%. While the percentage of those who measured their kidney functions and measured the level of lipids and cholesterol during the past year was 77.1% and 77.4%, respectively.

When asked about the number of monthly blood pressure measurements, the largest percentage of patients (68.57%) was for those who measured their blood pressure less than 3 times per month, while the lowest percentage (9.09%) was for those who measured their blood pressure more than 5 times per month, and 22.34% measured their blood pressure 3-5 times per month.

Moving to the question about the chronic complications of diabetes, such as heart diseases, neurological disorders and sexual disorders in males that require a visit to a specialist, the percentage of patients suffering from heart diseases that require a specialist visit was 31%, while the percentage of patients suffering from neurological disorders (especially in the hands and feet) was 60.8%. The percentage of male patients suffering from sexual problems (such as erectile dysfunction) was 57.79%.

Regarding the acute complications of diabetes, especially hypoglycemia and hyperglycemia attacks, 58.4% of the participants indicated that they had suffered from a hypoglycemic attack more than 6 times during the past year, followed by 26% of the participants who suffered from a hypoglycemic attack from 4 to 6 times during the year. In the past year, followed by patients who suffered from a hypoglycemic attack from 1 to 3 times during the past year with a rate of 4.9%, and 10.6% of the participants stated that they

did not suffer from a hypoglycemic attack not even once during the past year.

Compared to the number of hyperglycemia attacks, the largest proportion of participants who experienced more than 6 hyperglycemic episodes in the past year was 63.6%, followed by 15.6% of participants who had experienced 4 to 6 hyperglycemic episodes in the past year. While the percentage of patients who suffered from a hyperglycemia attack from 1 to 3 times during the past year was 10.9%. The lowest percentage was 9.9% for patients who did not suffer from a hypoglycemic attack not even once during the past year.

Looking at the data in (Table 8) and (Figure 5), we conclude that the most frequent factor in the sample for hypoglycemia attacks was not eating enough food or having irregular meals, which is the most important factor causing five or more episodes during the year in 3.12% of the patients, followed in terms of frequency by stressful physical activity and medication error, while mood disturbances or anger and illness or inflammation, were the two least frequent factors in the sample.

Table 8: number of hypoglycemia attacks regarding different factors

How many times	none	1	2	3	4	5
During the last year, how many times did you suffer from hypoglycemia because of an infection or illness?	312	56	13	4	0	0
During the last year, how many times did you suffer from hypoglycemia because of anger or disturbed mood?	322	43	12	8	0	0
During the last year, how many times did you suffer from hypoglycemia because of taking a wrong medication or wrong dose/ forgetting to take medication	72	88	136	63	22	4
During the last year, how many times did you suffer from hypoglycemia because of decreased food intake?	45	96	101	97	34	12
During the last year, how many times did you suffer from hypoglycemia because of more than usual physical activity?	65	222	33	47	18	0

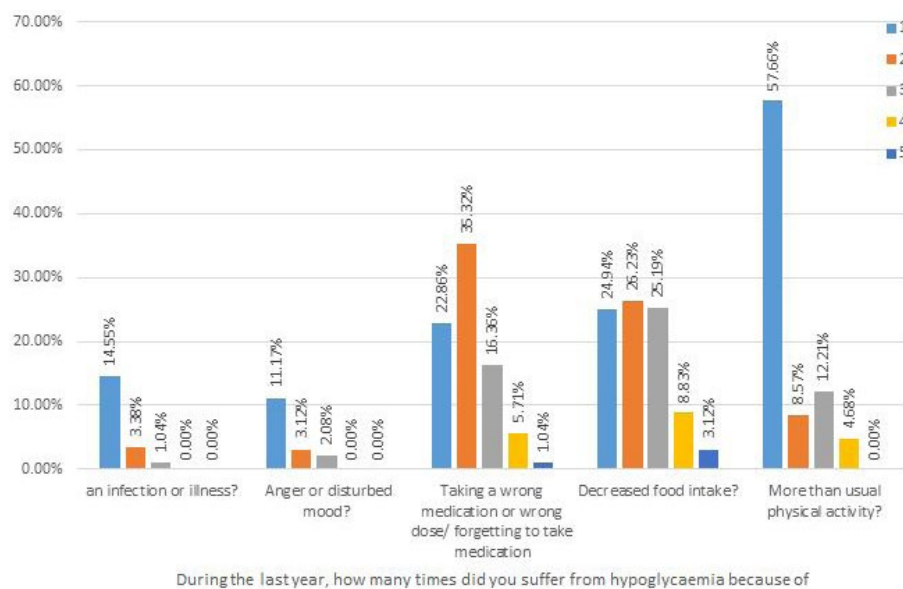


Figure 5: percentage of hypoglycemia attacks regarding different factors

We conclude from (Table 9) and (Figure 6) that the two most important factors for hyperglycemia attacks in the sample were non-adherence to medication and lack of dietary discipline, while lack of physical activity was the least frequent factor. By looking at the frequency of the attacks, we conclude that the most important reason for a single episode of hyperglycemia is having an infection which was in 221 (57.40%) of the participants.

Table 9: number of hyperglycemia attacks regarding different factors

	none	1	2	3	4	5
how many times did you suffer from hyperglycemia because of an infection or illness?	114	221	26	12	4	8
During the last year, how many times did you suffer from hyperglycemia because of anger or disturbed mood?	54	84	148	63	28	8
During the last year, how many times did you suffer from hyperglycemia because of taking a wrong medication or wrong dose/ forgetting to take medication	50	127	122	58	24	4
During the last year, how many times did you suffer from hyperglycemia because of increased food intake?	50	77	85	88	77	8
During the last year, how many times did you suffer from hyperglycemia because of less than usual physical activity?	224	123	26	9	0	0

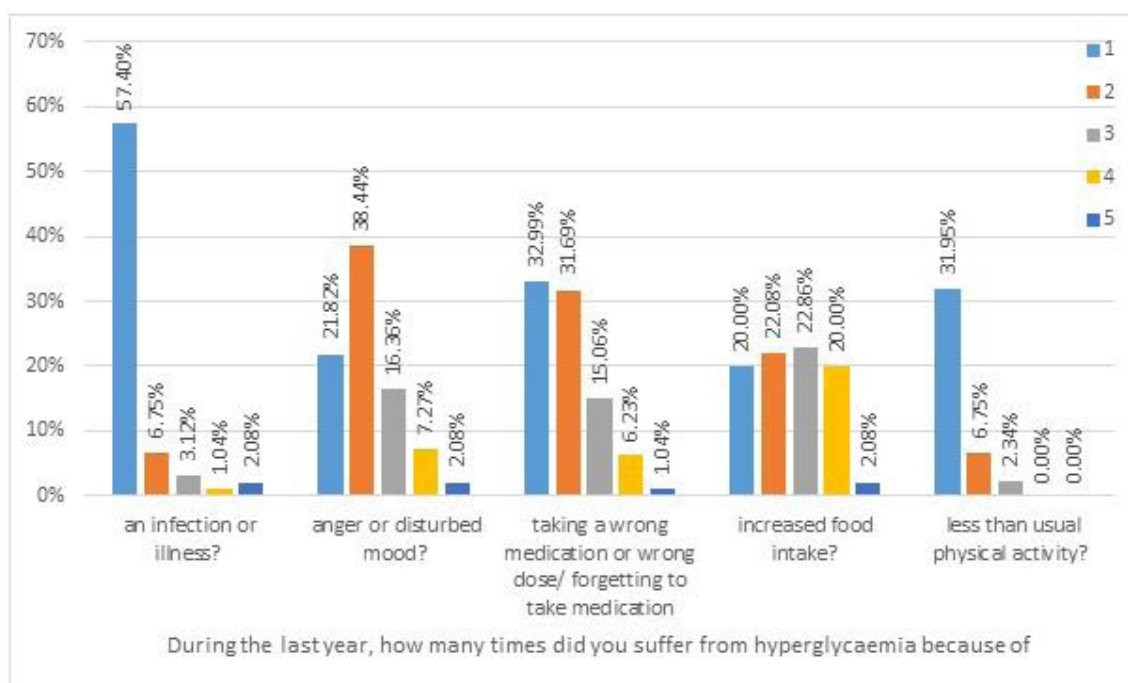


Figure 6: percentage of hyperglycemia attacks regarding different factors

Discussion

Our cross-sectional study evaluated the level of health care provided to diabetic patients in health centers by assessing three factors: the level of health awareness, the availability of drug therapy, and the quality of treatment follow-up. The main objective of the study was to link these factors to the levels of HbA1c and the development of hyperglycemia and hypoglycemia attacks, and the other common complications of diabetes mellitus.

Regarding age, the largest age group in the study was from 40 to 60 years, followed by the group of older than 60 years, and this suggests to us that type 2 diabetes is more likely to be affected by age [14].

Regarding education, the percentage of the uneducated and those who reached primary education was the largest group within the study, and this reflects to us the extent to which patients do not access health awareness programs about diabetes, its risks and symp-

toms in order of early detection and reduction of the occurrence of complications. It is necessary to educate them by inviting them to attend educational seminars and educational lectures in health centers and public hospitals, or through short television broadcasts or via the Internet.

The Largest Percentage Regarding Participants Work Was for Patients with Craft, Manual and Industrial Professions, Followed by Unemployed Patients. Here We Explain Two Important Ideas

The first idea is that one of the important risk factors for diabetes is profession in which intensity, fatigue and high accuracy is required [15].

The second idea is that sitting and not working may cause obesity, and therefore obesity is considered an important factor for the development of diabetes [15].

It is necessary to take steps in order to provide a work with less

intensity for these patients and to include them in health insurance programs, as they were not covered by the government health insurance.

It is anticipated for patients who do not have health insurance to face difficulties in purchasing medication in order to control diabetes, and this is a big problem for diabetics who suffer from poverty, as poor diabetic control will lead to the development of complications (such as peripheral neuropathy, Renal failure, heart failure etc.), which decreases the quality of life of these patients [16].

Smoking is considered an important risk factor in the development of diabetes complications [17]. Patients must be persuaded to quit smoking. Recently, the General Authority of Al-Mouwasat Hospital succeeded in opening a clinic which provides advice to patients to quit smoking, which is one of a kind in Syria.

Type 2 diabetes patients, as we mentioned earlier in the discussion, are the most common patients in our study. This is expected, as type 2 diabetes is the most common type of DM, and it is associated with heredity and environmental factors [18].

The presence of type 2 diabetes patients largely reflects the presence of family history in our study (the percentage is 75.58%), as T2DM is linked to genetics [19].

Regarding the assessment of the level of health awareness, the general knowledge about diabetes was moderate to some extent, where the level of patients' knowledge about the role of a healthy diet and the role of regular exercise in diabetes was moderate to good. And their knowledge of the drugs used in diabetes was poor. While their information about reading the results of blood sugar tests and preventing hypoglycemia and hyperglycemia attacks was at a very good to an excellent level. Their knowledge of foot care was good, and their knowledge of pregnancy and diabetes was poor. And it was found that the higher the educational level of the patients, the higher their health awareness level, and by moving to the relationship between the level of health awareness and the levels of HbA1c, there were no statistically significant differences between the averages of the levels of HbA1c, where the p-value was equal to 0.112 (p-value>0.05).

In regard to the evaluation of drug therapy, the largest proportion of patients used to glucose-lower drugs, and most of them did not know the side effects of their drugs, especially patients who used glucose-lowering drugs. It was found that the majority of patients do not face difficulties in acquiring treatment, as it was easy and free to obtain at public health centers, However, this did not prevent these patients from developing hyperglycemia attacks.

As for the difficulty in obtaining treatment, most patients do not face difficulty in acquiring treatment, but there is a good percentage of patients who face a difficulty in securing the treatment because of its high cost and this constitutes a great burden on the patients and their families due to their low social and economic status, as well as the increasing spread of diabetes, which has led to a significant increase in medical costs not only for patients, but also for general health [17,20].

As for the relationship between the difficulty of obtaining treatment and the episode of hyperglycemia, it did not reveal a statistically significant relationship between the two variables, where (p-value>0.05) p-value=0.228. Not using the treatment alone can cause an episode of hyperglycemia, however there are various other factors that can cause this, such as infections, excessive intake of sugar, forgetting to take medication, changing diet and lack of physical activity [21].

Moving to the relationship between facing the difficulty of high cost and the type of treatment, there was a statistically significant relationship between these two variables, where the largest percentage of people unable to secure treatment are users of glucose-lowering drugs this relationship is statistically significant as p-value=0.031 (p-value<0.05), which reflects the difficulty of acquiring glucose-lowering drugs more than other drugs.

Finally, the level of treatment follow-up was very good, as the majority of patients underwent periodic checks for HbA1c levels, kidney functions, and lipids and cholesterol levels, and the largest proportion of patients underwent monthly visits to the doctor and regular eye examinations, but there was a neglect of the foot examination. As for measuring the level of blood sugar, the majority of patients measured at least once a week, and the largest proportion had a blood glucose monitor at home.

A study conducted in Lebanon in 2017 showed that university level of education and the use of a special diet were significantly associated with increased knowledge about diabetes, and these results are quite similar to our study [22].

In several other studies, age has been found to be negatively correlated with the level of knowledge about diabetes, as younger people tend to be more enlightened than older people [23].

By comparison with other studies [24]:

REGARDING	OUR STUDY	INDONESIA	PERU	ROME	SOUTH AFRICA
SAMPLE SIZE	385	783	599	603	83
GENDER	N (%)	N (%)	N (%)	N (%)	N (%)
MALE	167 (43.4%)	500 (63.9%)	426 (71.1%)	321 (53.2%)	54 (64.1%)
AGE	40-60	53-65	52-67	51-66	47-60
EDUCATION	N (%)	N (%)	N (%)	N (%)	N (%)
UNEDUCATED	35.58%	30%	50.8%	14.2%	74.4%
PRIMARY EDUCATION	37.92	18.6%	18.7%	33.9%	12.1%
SECONDARY EDUCATION	12.73	28.9%	27.3%	41.7%	6.1%
UNIVERSITY EDUCATION	13.77	22.5%	3.2%	10.3%	2.4%
CHRONICITY	N (%)	N (%)	N (%)	N (%)	N (%)
LESS THAN A YEAR	NULL	17,6	21.1	20.3	2.5
1-5 YEARS	14.03	38.1	39.6	18.3	33.3
6-15 YEARS	16.36	35.8	23.2	41.4	44.4
MORE THAN 15 YEARS	69.61	8.6	16.1	20	19.8
TREATMENT	N (%)	N (%)	N (%)	N (%)	N (%)
ORAL GLUCOSE-LOWERING AGENTS	227 (59%)	887	482	646	99
INSULIN	88 (22.9%)	223 (28.5)	120 (20%)	406 (67.3%)	32 (38.6%)
INSULIN+ ORAL AGENTS	70 (18.2%)	63 (8.1%)	87 (14.5%)	29 (4.8)	1 (1.2)
SMOKING	N (%)	N (%)	N (%)	N (%)	N (%)
YES	44.09%	42.8%	42,6	44.1%	53.7%
NO	50.91%	57.2%	57.4%	55.9%	46.3%

Conclusion

The level of health education for diabetic patients in Damascus is generally average, and there are no difficulties in securing treatment for the majority of patients, and the therapeutic follow-up of the disease was at a high level, as laboratory tests required for diabetes are carried out periodically and regularly.

Declarations

Ethics approval and consent to participate

The Research Ethics Committee in the Syrian Private University and the ethical committees in the concerned hospitals approved the study protocol. Verbal informed consent was obtained from every participant before participation. All procedures performed in studies involving human participants were by the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent for publication

Not applicable.

Availability of data and materials

All data related to this paper's conclusion are available and stored by the authors. All data are available from the corresponding author on a reasonable request.

Conflict of interest

The authors declare that they have no conflict of interest

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Authors' contributions

O.A. and T.H. conceptualized the study. O.A. and M.A.S wrote the study protocol, performed the statistical analysis, participated in data collection, and did the literature search. M.A. participated in the literature search, interpret the results, wrote the main manuscript, and prepared the tables. T.H. revised the draft. All authors read and approved the final draft.

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References

1. International Diabetes Federation. (2021). Diabetes atlas 10th edition 2021 global fact sheet.
2. Misra, A., Tandon, N., Ebrahim, S., Sattar, N., Alam, D., Shri-

- vastava, U., ... & Jafar, T. H. (2017). Diabetes, cardiovascular disease, and chronic kidney disease in South Asia: current status and future directions. *bmj*, 357.
3. Phillimore, P., Zaman, S., Ahmad, B., Shoaibi, A., Khatib, R., Khatib, R., ... & Critchley, J. (2013). Health system challenges of cardiovascular disease and diabetes in four Eastern Mediterranean countries. *Global public health*, 8(8), 875-889.
 4. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. (2015). *Lancet* (London, England), 386(9995), 743–800.
 5. Yau, J. W., Rogers, S. L., Kawasaki, R., Lamoureux, E. L., Kowalski, J. W., Bek, T., ... & Meta-Analysis for Eye Disease (META-EYE) Study Group. (2012). Global prevalence and major risk factors of diabetic retinopathy. *Diabetes care*, 35(3), 556-564.
 6. Leon, B. M., & Maddox, T. M. (2015). Diabetes and cardiovascular disease: epidemiology, biological mechanisms, treatment recommendations and future research. *World journal of diabetes*, 6(13), 1246.
 7. Zheng, Y., Ley, S. H., & Hu, F. B. (2018). Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nature reviews endocrinology*, 14(2), 88-98.
 8. Gaziano, T. A., Bitton, A., Anand, S., Abrahams-Gessel, S., & Murphy, A. (2010). Growing epidemic of coronary heart disease in low-and middle-income countries. *Current problems in cardiology*, 35(2), 72-115.
 9. Yeung, R. O., Zhang, Y., Luk, A., Yang, W., Sobrepena, L., Yoon, K. H., ... & Chan, J. C. (2014). Metabolic profiles and treatment gaps in young-onset type 2 diabetes in Asia (the JADE programme): a cross-sectional study of a prospective cohort. *The lancet Diabetes & endocrinology*, 2(12), 935-943.
 10. Luk, A. O., Li, X., Zhang, Y., Guo, X., Jia, W., Li, W., ... & JADE Study Group. (2016). Quality of care in patients with diabetic kidney disease in Asia: The Joint Asia Diabetes Evaluation (JADE) Registry. *Diabetic Medicine*, 33(9), 1230-1239.
 11. Attaei, M. W., Khatib, R., McKee, M., Lear, S., Dagenais, G., Igumbor, E. U., ... & Manlu, Z. (2017). Availability and affordability of blood pressure-lowering medicines and the effect on blood pressure control in high-income, middle-income, and low-income countries: an analysis of the PURE study data. *The Lancet Public Health*, 2(9), e411-e419.
 12. Murphy, A., Palafox, B., O'Donnell, O., Stuckler, D., Perel, P., AlHabib, K. F., ... & McKee, M. (2018). Inequalities in the use of secondary prevention of cardiovascular disease by socioeconomic status: evidence from the PURE observational study. *The Lancet Global Health*, 6(3), e292-e301.
 13. Centers for Disease Control and Prevention. Diabetes 2017 report card. 2017.
 14. American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care* 2011;34 (Suppl 1):S62–9
 15. Bailey, S. C., Brega, A. G., Crutchfield, T. M., Elasy, T., Herr, H., Kaphingst, K., ... & Schillinger, D. (2014). Update on health literacy and diabetes. *The Diabetes Educator*, 40(5), 581-604.
 16. Caruso, R., Magon, A., Baroni, I., Dellafiore, F., Arrigoni, C., Pittella, F., & Ausili, D. (2018). Health literacy in type 2 diabetes patients: a systematic review of systematic reviews. *Acta Diabetologica*, 55(1), 1-12.
 17. Davis, T. C., Long, S. W., Jackson, R. H., Mayeaux, E. J., George, R. B., Murphy, P. W., & Crouch, M. A. (1993). Rapid estimate of adult literacy in medicine: a shortened screening instrument. *Family medicine*, 25(6), 391-395.
 18. Simonds, S. K. (1974). Health education as social policy. *Health Education Monographs*, 2(1_suppl), 1-10.
 19. Ratzan S, Parker R. Introduction. In *National Library of Medicine Current*
 20. Parker, R. M., Baker, D. W., Williams, M. V., & Nurss, J. R. (1995). The test of functional health literacy in adults. *Journal of general internal medicine*, 10(10), 537-541.
 21. Kiechle, E. S., Bailey, S. C., Hedlund, L. A., Viera, A. J., & Sheridan, S. L. (2015). Different measures, different outcomes? A systematic review of performance-based versus self-reported measures of health literacy and numeracy. *Journal of general internal medicine*, 30(10), 1538-1546.
 22. Karaoui, L. R., Deeb, M. E., Nasser, L., & Hallit, S. (2018). Knowledge and practice of patients with diabetes mellitus in Lebanon: a cross-sectional study. *BMC public health*, 18(1), 1-9.
 23. Stroup, D. F., Berlin, J. A., Morton, S. C., Olkin, I., Williamson, G. D., Rennie, D., ... & Thacker, S. B. (2000). Meta-analysis of observational studies in epidemiology: a proposal for reporting. *Jama*, 283(15), 2008-2012.
 24. Soetedjo, N. N., McAllister, S. M., Ugarte-Gil, C., Firanesco, A. G., Ronacher, K., Alisjahbana, B., ... & TANDEM Consortium. (2018). Disease characteristics and treatment of patients with diabetes mellitus attending government health services in Indonesia, Peru, Romania and South Africa. *Tropical medicine & international health*, 23(10), 1118-1128.

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