Perceived Adherence and Barriers to Dietary Recommendations among Type 2 Diabetic Patients in a Family Practice Clinic, Suez Canal University Hospitals

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Abstract:

Background: Type 2 diabetes mellitus (T2DM) is a major global health concern, with increasing prevalence worldwide. Dietary modification is the cornerstone and initial recommendation for management. Adherence to recommended dietary practice significantly affects diabetic control but is not uniformly practiced. **Objectives:** To assess perceived adherence and barriers to following recommended diet among T2DM patients. **Methods:** A descriptive study was conducted on 40 diabetic patients in the family practice clinic at Suez Canal University (SCU) hospital. T2DM participants were above 20 years of age. Patients were interviewed using El-Gilany questionnaire to assess socio-demographic characteristics. Perceived Dietary Adherence Questionnaire (PDAQ) was used for dietary adherence and Schlundt's taxonomy for obstacles against dietary adherence. **Results:** A significant percentage (97.5%) of the participants had poor adherence to dietary recommendations. The highest mean score was obtained for the question regarding consuming foods high in sugar and fat with a mean of 4.16 ± 2.19 and 4.70 ± 2.23 times a week respectively. In addition, participants had poor adherence to spacing carbohydrates evenly throughout the day and low consumption of foods prepared with olive oil with a mean of 0.21 ± 0.47 and 0.48 ± 0.55 times a week respectively. Lack of dietary knowledge (84%), inability to afford the cost of the recommended diet (61%) and stress (60%) were perceived barriers to practicing dietary recommendations. **Conclusion:** The rate of non-adherence to dietary recommendations among T2DM patients is high. Healthcare providers should be proactive in tackling barriers to non-adherence and promote adherence to dietary recommendations in T2DM patients.

Keywords: Diabetes, Healthy Nutrition, Obstacles

Introduction:

Diabetes mellitus (DM) constitutes one of the non-communicable threats to public health worldwide. Four hundred and seventy million people worldwide had diabetes in 2015, [(1)] and more than 39 million people in the Middle East and North Africa (MENA) regions; by 2045 this will rise to 67 million in the MENA region and 642 million worldwide. Diabetes is a fast-growing health problem in Egypt with a significant impact on morbidity, mortality, and healthcare resources.[(2)]

The prevalence of T2DM in Egypt is around 15.6% of all adults aged 20 to 79 in 2015,[(3)] there were 8.222.600 cases of

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diabetes in 2017.[2] To prevent T2DM and its complications, WHO recommends that patients achieve and maintain a healthy body weight, perform regular physical activity for at least 30 minutes, moderate-intensity activity on most days, eat a healthy diet and avoid sugar and saturated fats intake and tobacco use.[4]

The American Diabetes Association (ADA) recommends eating food low in sucrose and high in fiber, fruits, vegetables, whole grains, and legumes for secondary prevention of T2DM. Low-carbohydrate diets decrease postprandial glucose. However, these diets are also important sources of energy, fiber, vitamins, and minerals for individuals with diabetes. [5] According to the literature, patients play the most important role in the treatment and control of diabetes.[6]

Adherence to a healthy diet is recommended as the major, first, and most difficult step in diabetes management. Adherence to a healthy diet can be affected by various intrapersonal, interpersonal, and social factors. Adherence can be improved in patients by identifying and removing barriers to a healthy diet.

There is a mandate for healthy nutrition for diabetic patients, especially from the perspectives of both the patients and their physicians, which is highly supportive for planning educational programs and determining compliance.[7]

The present study seeks to explore the experiences of T2DM patients and their barriers to adherence to their recommended diet and help with the design of future interventions. The current study aims to assess adherence and barriers to recommended diet among T2DM patients.

Methods:

Study design and sampling method: The researchers conducted a cross-sectional interventional study on 40 T2DM patients in July-October 2021. The sample size was calculated using the following equation $n = 2\left[\frac{(Z_{\alpha/2}+Z_{\beta})*\sigma}{\mu_1-\mu_2}\right]^2$. Where: n= sample size required in each group, Zα/2 = 1.96 (The critical value that divides the central 95% of the Z distribution from the 5% in the tail), Zβ = 0.84 (The critical value that separates the lower 20% of the Z distribution from the upper 80%) (8), σ = the estimate of the standard deviation in the intervention group = 1.89,μ1= mean of HbA1c level of diabetic patients before the intervention of health education =10.41 (9), μ2= means of HbA1c level of diabetic patients after the intervention of health education =8.22 (9) So, from the equation, the sample size was 12 participants, after calculating 20% drop out, the total sample size was 15 participants,

we extended the sample size to be 40 participants.

The researchers conducted the study in the family practice clinic at SCU hospital, being the major governmental teaching university hospital in Ismailia governorate. The sample units were collected using a non-probability convenient sampling technique for patients attending a family practice clinic seeking medical advice.

Study participants and data collection:

Inclusion criteria: T2DM patients above 20 years of age, with $HbA_{1c} > 7$, who could give informed consent, and without any residential restriction.

Exclusion criteria: pregnant diabetic patients, patients < 20 years old, T2DM diabetics with $HbA_{1c} < 7$, and critically ill patients who are unable to participate in the interview.

- The first part included El-Gilany *et al.*, 2012 [(10)] questionnaire, which was used to assess patients' socio-demographic characteristics including 7 domains: (education, culture, occupation, family, home sanitation, economic, and health care) with a total score of 84.
- The second part included medical history assessment: duration of diabetes, therapeutic regimen, other medical treatment, presence of comorbid diseases, and adherence to medications in this study. We used the four-item Morisky Medication Adherence Scale (MMAS), which includes four questions with yes/no response options. The MMAS resulted in a score ranging from 0 to 4, and the developers suggested three levels of medication adherence based on this score: high, medium, and low adherence with 0,1–2, and 3–4 points, respectively. [(11)]
- The third part was used to evaluate the level of dietary adherence and perceived barriers to dietary adherence among T2DM patients, using the Perceived Dietary Adherence Questionnaire (PDAQ).

The PDAQ is a nine-item questionnaire that was developed in 2015 by Ghada Asaad *et al.* to measure patients' perceptions of their dietary adherence.[(12)] The response is based on a seven-point Likert scale to answer the question.

The high scores indicate a better adherence, yet for items; 4 and 9, we had to invert the scores, given that the two questions reflected the use of unhealthy choices such as foods with high sugar or fat content. Patients were classified as having good dietary adherence if they eat a healthy diet for at least four days per week.

Barrier items studied are based on Schlundt's taxonomy for obstacles to dietary adherence in diabetics. Concerning the context of barriers to appropriate eating, we

specifically assessed the following: perception of food knowledge, cost, and desire to adhere to an appropriate diet.[4]

All involved patients were uncontrolled diabetics, also most of them had lack of knowledge regarding diabetic dietary recommendations; this represented the highest percentage of barriers in our study.

Thus, following the interview and health education sessions with the patients regarding the different food groups and items, nutritional elements, and exchange units, the investigator set an in dividual dietary plan for each patient according to the baseline assessment. Patients were willing to change their dietary habits.

The investigator used the plate method for guiding the patients as a simple method to measure the amount of the taken food and improve their dietary adherence. This was done by prescribing 1500 and 1800 calories for females and male patients according to the American diabetes association guidelines (ADA2021).

Such an individualized dietary plate plan supported the study participants' to consume a low caloric balanced diet and achieving a weight loss of 5% to 10% of body weight.

Data management: Data analysis was performed using Statistical Package of Social Services version 24 (SPSS). We used tables and graphs for data presentation, continuous quantitative variables were expressed as mean ± SD & range, and categorical qualitative variables were expressed as frequencies and percentages.

Administrative Approval: The faculty of medicine, SCU approved the study following the official permission letter of the head of the family medicine department, SCU.

Ethical Approval: A consent was taken throughout the whole study including informing the participants of the purpose and nature of the study through a written consent form signed by the participants. Coded numbers for each participant were used to guarantee confidentiality. Official approval from the Institutional Review Board (IRB) was taken (number: 3903, July 2019).

Results:

The current study included 40 diabetic patients, their ages ranged from 35-64 years old, 32 (80%) were females and 8 (20%) were males. 87.5% of males were working, while only 25% of females were working, 50% of females were illiterate versus 17.5% of males. More than half of the studied patients were residents of urban/ urban slum areas (65%).

Table (1) shows that the mean age of participants is 52.00 ± 7.69 years, and ranges from 35 to 64 years. The majority of participants were females (80%). The

greatest percent of participants come from urban/ urban slum areas (65%). Most husband's occupations are unskilled manual workers (37.5%), while most females are housewives (75 %).

Regarding the crowding index, about 65% of the participants have more than one person in each room. More than half of the participants (57.5) can just meet their routine daily expenses. In addition, 5.4% of them were of high social class.

Figure (1) shows the distribution of studied diabetic patients according to their total score of socioeconomic levels (84) classified into (very low, low, middle, and high levels depending on the quartiles of the score calculated). The majority of the participants belong to the low socioeconomic level (59.5%), while participants with high socioeconomic status form only 5.4 % respectively.

Table (2) shows the medical characteristics of the studied diabetic patients. In addition, it shows that 56.8% of the patients have a high level of adherence, while 8.1% of the patients have a low level of adherence to medications, respectively. More than 55% of the patients were diabetic for more than 10 years.

The most common medications given to the patients were a combination of metformin and insulin (50 %), and metformin and sulfonylurea (37.5%) respectively.

Moreover, about 72.5% of the patients had other comorbid diseases where neurological diseases and high cholesterol levels are the most common ones (65% and 47.5 respectively). 56.8% of the patients have a high level of adherence, while 8.1% of the patients have a low level of adherence to medications, respectively (according to Morisky scores high, medium, and low adherence with 0, 1–2, and 3–4 points, respectively).

Perceived dietary adherence questionnaire (PDAQ) score: The highest mean score was obtained for the question 'On how many of the last SEVEN DAYS did you eat foods high in fat (such as high-fat dairy products, fatty meat, fried foods, or deep-fried foods)?'.

The second highest mean score was obtained for the question 'On how many of the last Seven days have you eaten food high in sugar, such as rice, potatoes, etc.??'.

Participants obtained the lowest mean score, for the question 'On how many of the last Seven days did you space carbohydrates evenly throughout the day?' and 'On how many of the last SEVEN DAYS did you eat food contained or was prepared with canola, walnut, olive, or flax oils'?.

Table (3) shows that the majority (97.5%) of the study participants had poor dietary adherence based on PDAQ, while only 2.5% of the participants had good adherence to dietary recommendations.

The highest mean score was obtained for the Question about eating fatty and sugary foods (4.70 ± 2.23 and 4.16 ± 2.19 respectively), while they have a low mean score for to question for Spacing carbohydrates evenly throughout the day (0.21 ± 0.47).

Among possible perceived barriers that hinder the patient's adherence to the dietary recommendation; were lack of knowledge (84%%), inability to afford the cost of the recommended diet (61%), and stress (60%) were the major barriers claimed by the study participants.

Figure (2) shows that lack of knowledge (84%), inability to afford the cost of the recommended diet (61%) and stress (60%) were the commonest perceived barrier to the recommended diet respectively. On the other hand, 8% of them could not remember.

Discussion:

This descriptive study aimed to evaluate adherence and barriers to recommended diet among T2DM. The study included 40 diabetic patients attending the FP outpatient clinic at SCU. Only 2.5 % of the study participants had good adherence to a healthy diet.

This is contrary to the results of two studies conducted in Ethiopia[4,5] which reported a good adherence of 37.5% and 25.7% respectively among their subjects. This difference might be attributable to the diversity of the setting, socioeconomic standards, and meal choices in different countries.

The current study was in agreement with the results of a study conducted in Italy by Rivellese *et al* 2008, which assessed adherence of T2DM patients to dietary recommendations, and revealed that the overall the adherence to dietary recommendations was 3%.[13]

Despite the discrepancy between the present study with the two studies conducted in Ethiopia regarding overall adherence, there was a similarity in the item's score of PDAQ, the highest mean score was obtained for the question of eating foods high in sugar, such as rice and potatoes.[4,5]

This could be due to the inexpensive and readily available carbohydrate-containing food. While participants obtained the lowest mean score, for the question of eating fish or other foods high in Omega-3 fats and eating some fruits and vegetables. Likewise, the seasonality of fruits and vegetables and their

cost could be the reason for the low adherence.[4,5]

In the present study, 84% of the study participants reported a lack of dietary knowledge as the main barrier that hinders adherence to the recommended diet. Another obstacle reported by (61%) of the participants was the inability to afford the cost of the recommended diet as the reason for non-adherence. On the other hand, 8% of them were unable to remember.

Therefore, improving the knowledge of diabetic patients regarding dietary recommendations with a special focus on patients with low educational levels is highly important. The cost of the recommended diet represented the second cause of non-adherence to dietary recommendations.

These results were consistent with Asnakews' study 2018[4], and Mohammed *et al* 2020[5] which reported a lack of knowledge, lack of diet education, inability to afford the cost of a healthy diet, and poor awareness about the benefit of dietary recommendations were the major reasons for poor dietary adherence. This result might be attributable to the fact that more than half of the participants belong to a low socioeconomic level (59.5%).

Findings from another two studies have identified the cost of food as a barrier to non-adherence to dietary recommendations among diabetic patients.[14,15] The annual increase in the cost of healthy foods might have a negative impact on patients who were from low socioeconomic levels. Therefore, educating diabetic patients about affordable healthy foods which can be prepared at home, may benefit low-income patients and increase their dietary adherence.

Contrary to the study of María VL *et al,* 2019 about assessing the barriers to adherence to a nutritional plan and strategies to overcome them in patients with T2DM, where a "Lack of information on an adequate diet" (24.7%), "I eat away from home most of the time" (19.7%), and "Denial or refusal to make changes in my diet" (14.4%). which was inconsistent with our causes.[16]

A study conducted by Darani *et al,* 2020 in Iran showed that social factors are major barriers to the adherence of T2DM patients to a healthy diet,[17] while the study in Iran revealed that situational barriers and stress-related eating disorders/costs were the main barriers against adherence.[18]

Also, a study in Africa mentioned that the most identified barrier was the cost, followed by small portion sizes, support, and family issues.[14]

Study Limitations: The COVID-19 pandemic crisis led the investigator to proceed with the study participants using phone calls, and what's app messages for

follow-up. Our results can't be generalized given that small sample size (40) is not representative of T2DM diabetic population.

Conclusion: In the present study, non-adherence to dietary recommendations among T2DM is high as evidenced by 97.5% of the study participants reporting non-adherence. Lack of knowledge, inability to afford the recommended diet and stress were the most significant barriers responsible for non-adherence.

Recommendations: Health professionals should become proactive in identifying and addressing dietary recommendation barriers. In addition, we suggest future studies that address traditional plates and food items using a national validated tool. Health care decision and policymakers should design effective dietary practice guidelines for people with T2DM in areas where recommended diets are unavailable.

Competing interests: None.

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Table (1): Frequency Distribution of the studied diabetic patients according to their socioeconomic characteristics (N=40)

Socioeconomic Variables	Frequency	Percent (%)
Age (years)		
▪ Mean ±SD	52.00 ± 7.69	
▪ Median(range)	50 (35-64)	
Gender		
▪ Male	8	20%
▪ Female	32	80%
Residency		
▪ Urban/ Urban slum	26	65%
▪ Rural	14	35%
Husband's education		
▪ Illiterate/	7	17.5%
▪ Read and write	11	27.5%
▪ Primary school	2	5%
▪ Preparatory school	5	12.5%
▪ Secondary	8	20%
▪ Intermediate	3	7.5%
▪ University/ Postgraduate degree	4	10%
Wife's education		
▪ Illiterate	20	50%
▪ Primary school	5	12.5%
▪ Preparatory school	4	10%
▪ Secondary	4	10%
▪ Intermediate	2	5%
▪ University/ Postgraduate degree	5	12.5%
Husband's occupation		
▪ Unemployment	5	12.5%
▪ Unskilled manual worker	15	37.5%
▪ Skilled manual worker/ Farmer	8	20%
▪ Trades/business	4	10%
▪ Semiprofessional/clerk	1	2.5%
▪ Professional	7	17.5%
Wife's occupation		
▪ Housewife	30	75%
▪ Unskilled manual worker	4	10%
▪ Semiprofessional/clerk	1	2.5%
▪ Professional	5	12.5%
Crowing index		
▪ ≤ 1 person per room	14	35%
▪ > 1 person per room	26	65%
Income from all resources		
▪ Indebt (inadequate)	10	25%
▪ Just meet routine expenses (adequate)	23	57.5%
▪ Meet routine expenses and emergencies (adequate)	6	15%
▪ Able to save/invest money	1	2.5%

Table (2): Frequency distribution of the studied diabetic patients regarding to their medical characteristics

Medical Variables	Frequency	Percent
Duration of diabetes mellitus		
▪ < 5 years	7	17.5%
▪ 5 – 10 years	11	27.5%
▪ > 10 years	22	55%
Type of antidiabetic drugs		
▪ Metformin + Insulin	20	50%
▪ Metformin + Sulfonylurea	15	37.5%
▪ Metformin/ Sulfonylurea + DPP4	2	5%
▪ Sulfonylurea only	2	5%
▪ DPP4+ SGLT 2	1	2.5%
Comorbidities/complications		
Absent	11	27.5%
Present	29	72.5%
▪ Neurological disease	26	65%
▪ Hypercholesterolemia	19	47.5%
▪ Eye disease	16	40%
▪ Hypertension	14	35%
▪ Thyroid disease	1	2.5%

Table (3): Perceived higher dietary adherence among the studied group

Adherence Variables	Mean ± SD
▪ Following a healthful eating plan.	0.70 ± 0.93
▪ Eating the number of fruit and vegetable servings you are supposed to eat.	1.81 ± 1.41
▪ Eating carbohydrate-containing foods with a low Glycemic Index.	0.64 ± 1.25
▪ Eating foods high in sugar.	4.16 ± 2.19
▪ Eating foods high in fiber such as oatmeal, high fiber cereals, and whole-grain breads.	0.86 ± 1.29
▪ Spacing carbohydrates evenly throughout the day.	0.21 ± 0.47
▪ Eating fish or other foods high in omega-3 fats.	1.24 ± 0.54
▪ Eating foods that contained or was prepared with canola, walnut, olive, or flax oils.	0.48 ± 0.55
▪ Eating foods high in fat.	4.70 ± 2.23
Overall adherence	N (%)
▪ Good	1(2.5)
▪ Poor	39(97.5)

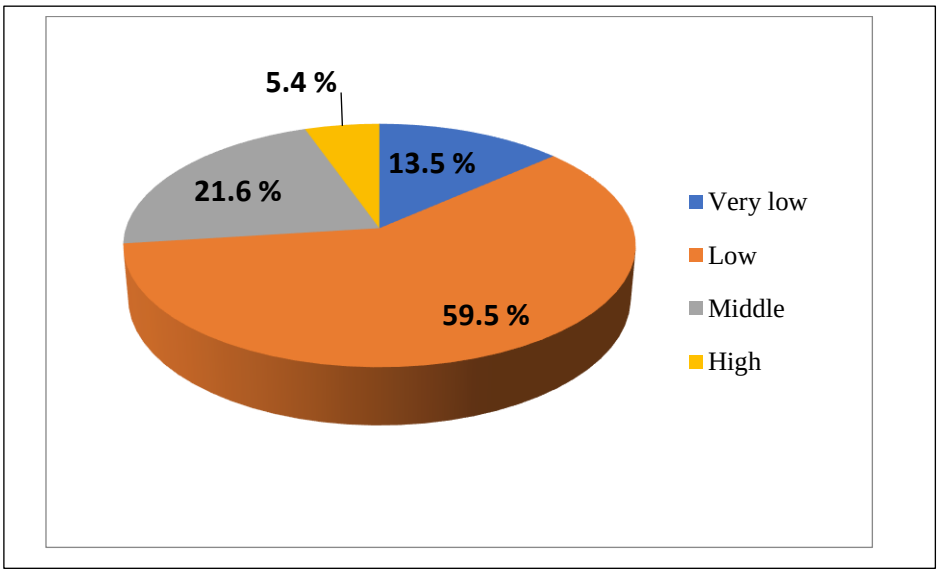

Figure (1): Frequency distribution of studied diabetic patients according to their total score socioeconomic level

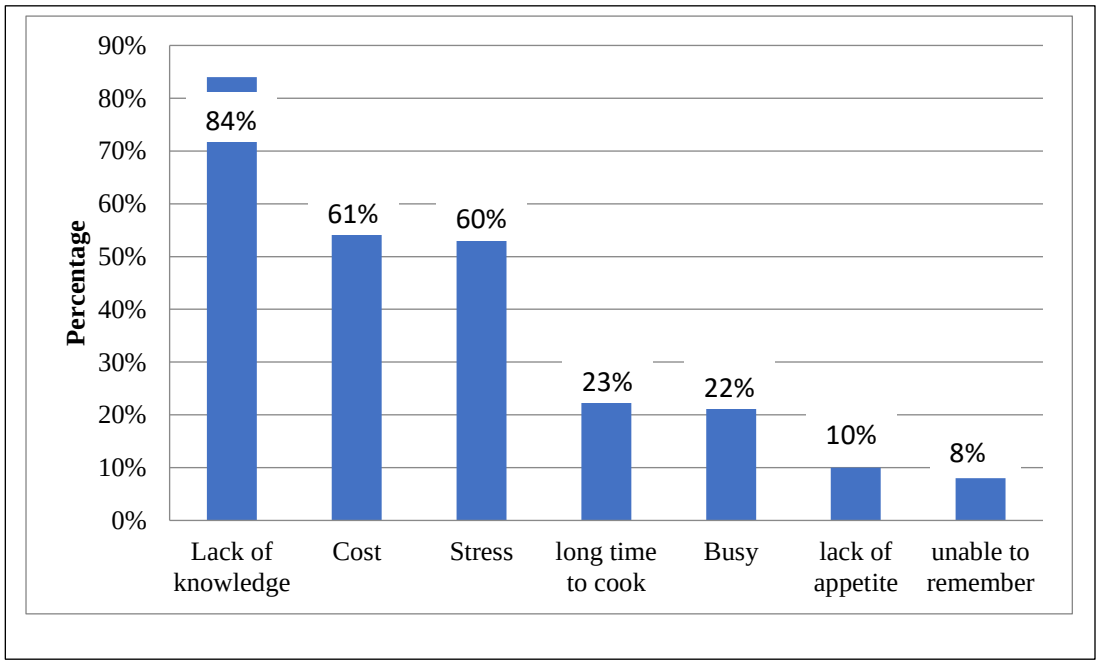

Figure (2): Perceived barriers to the recommended diet among the studied diabetic patients

الملخص العربي

الألتزام والعوائق بالتوصيات الغذائية لمرضى السكري من النوع الثاني

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الخلفية: يعد مرض السكري من النوع الثاني مصدر قلق كبير للصحة العالمية، ويتزايد انتشاره بسرعة في جميع أنحاء العالم. إن الالتزام بالنظام الغذائي الموصي به يلعب دورًا هامًا في السيطرة على مرض السكري **الهدف:** قياس الالتزام والعوائق بالتوصيات الغذائية لمرضي السكري من النوع الثاني. **المنهجية وطرق البحث:** أجريت دراسة وصفية على 40 مريضا بالسكري. تم تطبيق الدراسة في عيادة طب الأسرة بمستشفى جامعة قناة السويس. كان أعمار المرضى الذين تم دراستهم أكبر من ٢٠ سنة من النوع السكري الثاني. تم إجراء مقابلات مع المرضى باستخدام استبيان الجيلاني لتقييم الخصائص الديموغرافية واستبيان مصمم مسبقًا لتقييم الالتزام والعوائق. **النتائج:** شكل الالتزام بالتغذية الصحية ٢,٥٪ فقط حيث استهلاك الطعام الدسم والنشويات أعلي المستويات بينما كان من اهم العوائق للالتزام بالتوصيات الغذائية قلة المعلومات عن التغذية الصحية ٨٤ ٪ ويليه عدم القدرة على تكلفة الغذاء الصحي (٦١ ٪) ثم الضغط العصبي (٦٠٪). **الخلاصة:** يجب أن يصبح الاطباء سباقين في تحديد ومعالجة هذه العوائق وتصميم مبادئ توجيهية فعالة للممارسات الغذائية للأشخاص الذين يعانون من مرض السكري الثاني.