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Diabetes Score questionnaire for lifestyle change in patients with type 2 diabetes

ABSTRACT

Background. Designed for use in clinical settings, the Diabetes Score is a 10-item, one-page questionnaire for discussing lifestyle change. We aimed to evaluate the Diabetes Score questionnaire for its validity and acceptability among individuals with type 2 diabetes.
Methods. An observational study was conducted using interviewer-administered questionnaires to adult patients with type 2 diabetes at three ambulatory clinics. We used the Diabetes Score questionnaire for measuring adherence to diet, exercise and other lifestyle recommendations. The questionnaire yields an intuitive score ranging from 0 to 100, by addition of each of the 10 items which are rated as 0, 5 or 10 by the patient. A score of more than 60 was considered satisfactory.
Results. A total of 311 patients, 56% females, with a median age of 55 years (range: 23 to 87) participated in the study. Diabetes Score correlated with glycemic control, HbA_{1c} (r = –0.20) and blood glucose (r = –0.25; P < 0.001), indicating validity. Reliability was demonstrated by internal consistency (alpha .577) and discriminant factor analysis. Based on multivariate modeling, an improvement of 30 points on the Diabetes Score corresponded to a drop in HbA_{1c} by 1.0%-unit (11 mmol/mol).
Conclusion. Diabetes Score is a valid and reliable tool for empowering lifestyle and behavior modification among patients with diabetes mellitus. This brief and free-to-use questionnaire has the potential to be used in diabetes clinics to discuss behavior change. It can serve as the first-line intervention in diabetes patients while reducing the cost of diabetes care. (Clin Diabetol 2020; 9; 6: 379–386)

Key words: diabetes mellitus, behavior change, lifestyle modifications, chronic disease care, non-communicable diseases

Introduction

Increasing evidence supports the need to focus on modifiable lifestyle factors in addition to glycemic control among individuals with diabetes [1, 2]. Self-management education on healthy diet and a physically active lifestyle, as well as regular support from healthcare professionals can enable individuals to achieve their glycemic targets with less intensive medications, improve wellness and reduce long-term complications [3]. However, implementation of these behavioral interventions has been challenging in clinical settings [4, 5].

While questionnaires have been used to measure lifestyle factors among individuals with diabetes, most are lengthy, complicated and cumbersome to score. The length of these questionnaires can exceed 65 items, spanning over 14 pages [6]. Complex scoring algorithms can be burdensome, sometimes necessitating

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the use of computer software [7]. A few require prior written permission or payment for usage. Intentionally "designed especially to enable scientific studies" [8], many questionnaires serve as information gathering tools for research. Other questionnaires are focused on quality of life, and contain items pertaining to patient perceptions and expectations. There appears to be a lack of a brief and easy-to-use questionnaire designed for shared decision-making and improving lifestyle among individuals with type 2 diabetes.

We sought to evaluate the Diabetes Score questionnaire for its validity and acceptability among individuals with type 2 diabetes.

Methods

Questionnaire design

The Diabetes Score is a behaviorally-oriented questionnaire developed specifically for clinical use [9]. It is a theoretically-derived health rating scale that targets condition-specific behaviors for personally meaningful reasons as postulated in the self-management theory [10, 11]. By being brief and easy-to-understand, the instrument enables individuals with diabetes to see how well they are following evidence-based guidelines for healthy lifestyle targets [Supplementary Appendix]. The questionnaire consists of 10 behaviorally-oriented items carefully designed to motivate patients to adopt a healthier lifestyle. Each item is rated by the patient as either 0, 5 or 10-points based on a rubric of lifestyle targets. The item ratings are summed up to yield an intuitive total score ranging from zero to 100 points. This allows patients and physicians to measure progress and discuss areas for improvement and target behaviors. Any form of tobacco use such as cigarette smoking leads to a 20-point reduction. Simplicity is a virtue when advocating lifestyle change. For instance, it has been shown that a structured meal plan is sufficient compared to a detailed, individualized eating plan among patients with type 2 diabetes [12]. Layout of the questionnaire is designed to be visually appealing and easy to understand. A color-coded table enables rapid interpretation of total scores.

The content of Diabetes Score questionnaire is informed by a rich evidence base on behavior change in diabetes research [13, 14]. These reviews recommend a healthful eating pattern, reduced calorie intake, regular physical activity, health education and social support as primary treatment strategies [13–15]. Consequently, the Diabetes Score questionnaire is structured to include items on nutrition, physical activity and self-care. The items are judiciously constructed to be behaviorally oriented and actionable, thus potentially empowering to patients. Non-actionable items such as current hemoglobin A_{1C} level, body mass index and blood pressure were excluded. Such items have been shown to be ineffective in motivating patients for behavior change [16].

Study design and setting

An observational study was carried out at three ambulatory clinics in three cities: Islamabad, Rawalpindi and Peshawar, Pakistan, from July 2017 to March 2018. The clinics serve a wide range of patients: one of the clinics is a community diabetes clinic, another is a teaching clinic affiliated with a medical college, and the third is an ambulatory center in a general hospital.

Participants and data collection

Researcher-administered, printed questionnaire forms were used to conduct interviews with participants after obtaining verbal informed consent. Eligibility criteria included adult patients (age more than 18 years) with an established diagnosis of diabetes mellitus. Patients were excluded if they had apparent visual, hearing or mental impairment that would limit comprehension of the interview. The primary outcome measure was the correlation of Diabetes Score with glycemic control. The body mass index (BMI) was calculated as the weight in kilograms divided by the height in meters squared. Participants were asked additional questions including age, years of formal education completed, current occupation as well as four questions on perceived satisfaction with the Diabetes Score questionnaire.

Statistical analysis

A minimum sample size of at least 127 patients was calculated based on the assumption that the correlation between HbA_{1c} and Diabetes Score will be 0.1, with a power (beta) of 80% and type I error rate (alpha) of 0.05 (UCSF Sample Size Calculators, www.sample-size.net/correlation-sample-size/).

The prespecified analyses included bivariate correlation between Diabetes Score and HbA_{1c}, and multiple linear regression with HbA_{1c} as the outcome variable. Psychometric validation of the questionnaire was conducted using reliability analysis based on the alpha (Cronbach) model for internal consistency, followed by factor analysis for dimensionality of items [17]. All statistical analyses were conducted with the current version of SPSS (IBM SPSS Inc.). An alpha level of $P < 0.05$ was considered statistically significant.

Results

A total of 311 patients with type 2 diabetes mellitus participated in the study (Table 1). The median age

Table 1. Participants' sociodemographic and clinical characteristics (n = 311)

Characteristic	n (%)
Sex	
Males	132 (42.4)
Females	176 (56.6)
Age (years)	
20–29	4 (1.3)
30–39	18 (5.8)
40–49	70 (22.5)
50–59	114 (36.7)
60–69	62 (19.9)
70–79	22 (7.1)
80 or more	4 (1.3)
Education (years of schooling)	
None	91 (29.3)
Primary (up to 10 years)	62 (19.9)
Secondary (up to 12 years)	52 (16.7)
College (13 years or more)	62 (19.9)
Years since diagnosis of diabetes	
Less than 5 (newly diagnosed)	76 (24.4)
5 to 9	89 (28.6)
10 to 14	45 (14.5)
More than 15	67 (21.5)
Body mass index [kg/m^2]	
25.0–29.9 overweight	8 (2.6)
30.0–34.9 obese	34 (10.9)
35.0–39.9	62 (19.9)
40.0–44.9 morbidly obese	74 (23.8)
45.0–49.9	62 (19.9)
50.0+	55 (17.7)
HbA_{1c} (%)	
< 6.50	2 (0.6)
6.50–6.99	5 (1.6)
7.00–7.99	11 (3.5)
8.00–11.99	19 (6.1)
12.0 or greater	10 (3.2)
On insulin	128 (41.2)

was 55 years (minimum 23, maximum 87 years) with a mean of 53.8 years (standard deviation [SD], 10.7). The participants' occupations ranged from white-collar professions such as teaching to labor-intensive work such as farming. Among female participants, 84% stated that they were homemakers. Many patients were fairly recently diagnosed with diabetes, with 65% having been identified less than 10 years ago. The body mass index (BMI) ranged from 26 to 71 kg/m^2, with a mean of 43 kg/m^2 (SD, 7.2). The mean waist circumference for women, 102 cm (40.2 inches), exceeded that for men, 96 cm (37.8 inches) (P = .24). Missing values were generally low except for recent HbA_{1c} and waist circumference while blood glucose levels were available for 99% of patients.

The mean Diabetes Score was 58.0 points (SD, 17.1), with a median of 60, on a scale ranging from zero to 100 points. Participants reported better adherence to dietary recommendations than for physical activity and exercise (Fig. 1). About half (46.9%) reported avoiding sweets rich in simple sugars (high glycemic index foods) and 84.6% were eating at least one serving of fruits or raw vegetables. On the other hand, 104 (33.4%) admitted that they were not engaging in vigorous aerobic exercise at all, while 82 (26.4%) were not doing any home exercises. While most patients were accessing health education, only 27.7% reported performing regular foot examinations. The highest rated item was self-reported continuity of physician visits and compliance with medications (Fig. 1). In this cohort, 12 (3.9%) of patients smoked cigarettes. Comparison of individuals grouped into high (more than 50 points) and low total Diabetes Score revealed that the latter were less educated, more overweight, and had higher blood glucose levels (Table 2).

Diabetes Score correlated with HbA_{1c} (r = .20) and random blood glucose (r = .25). Diabetes Score was associated with years of schooling (r = .22) indicating an effect of education on healthy lifestyle. However, there was a lack of correlation –with age (r = –.096), or duration of diabetes (r = –.036). From multivariate analysis, we found that glycemic control (HbA_{1c}) was weakly predicted by the patients' Diabetes Score (regression coefficient, –0.030), BMI (0.28), and duration of diabetes (–0.15). However, none of the predictors reached statistical significance (adjusted R^2 = 0.017).

Psychometric validation

The questionnaire items showed fair internal consistency (Cronbach's alpha, 0.577; n = 311). Between items comparison showed significant differences across the questions (ANOVA, p < 0.001). As expected, inter-item correlations showed moderate associations among items on physical activity as well as between those on nutrition (r = .2 to .4), indicating construct validity of these subscales. On the other hand, there was a lack of correlation between diet items and those related to exercise (r = –.015 to .033). This was confirmed on factor analysis which yielded separate components related to exercise and diet with fairly high eigenvalues explaining variance of the total Score, 21% and 14% respectively. Sensitivity analysis indicated that removal of certain items (for example, foot examination) would improve the reliability nominally (Cronbach's alpha increased from 0.577 to 0.582).

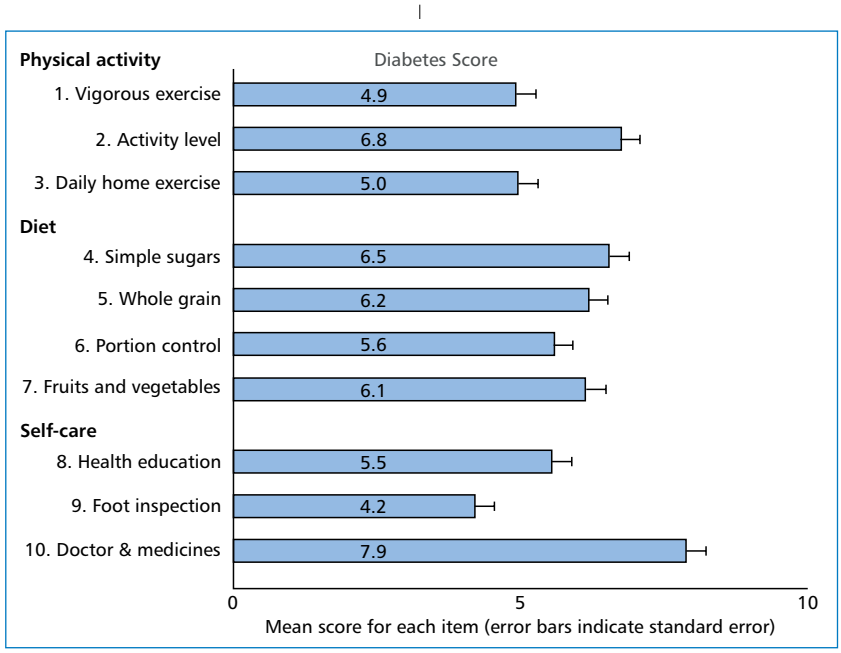

Figure 1. Mean self-ratings for each item in the Diabetes Score questionnaire (n = 311)

Table 2. Clinical characteristics of participants divided into high and low Diabetes Score groups

Characteristic	High score (> 50) Desirable (n = 197) Mean (SD)	Low score (≤ 50) Sub-optimal (n = 114) Mean (SD)	P value one-way ANOVA
Age (years)	53 (11)	55 (11)	.078
Education (years of schooling)	8.8 (5.9)	6.2 (5.9)	.001
Recent HbA_{1c} (%)	9.5 (3.1)	9.5 (2.5)	.988
Random blood glucose [mg/dL]	246 (83)	318 (112)	<.001
Fasting blood glucose [mg/dL]	190 (80)	228 (85)	.017
BMI [kg/m^2]	42.3	44.5	.009
Weight [kg]	71 (12)	74 (12)	.034
Duration of diabetes (years)	9.3 (6.1)	9.1 (6.1)	.764

BMI — body mass index

Participant satisfaction with Diabetes Score

Additional questions on satisfaction with the Diabetes Score questionnaire were asked to assess participant's perceptions. More than 40% of participants liked the Diabetes Score questionnaire while only 5.8% did not (the rest were unsure or did not respond). Similarly, 41% of the participating patients indicated that they would use the questionnaire in future while only 1.3% would not. Suggestions to improve the form included adding detailed instructions, dietary advice and exercise guidelines.

Discussion

In this study, Diabetes Score correlated with glycemic control among adults with type 2 diabetes, with a 30-point improvement in the Score corresponding to a drop of 1.0%-unit (11 mmol/mol) in HbA_{1c}. Psychometric properties revealed internal consistency, construct validity and moderate satisfaction ratings, indicating that the instrument demonstrates validity.

It is pertinent to note that other diabetes questionnaires have been validated using the same study design with similar sample sizes of about 300 patients.

Furthermore, the correlation with HbA_{1c} has also been about –.20 as their primary validation outcome. It is useful to illustrate this with a few examples. The 28-item, Type 2 Diabetes and Health Promotion Scale (T2DHPS) questionnaire was studied in 323 subjects, and had a correlation of –0.25 with HbA_{1c} [18]. This questionnaire asks the respondent to make judgements which are not easily translated into behavioral actions; for example, "I have a balanced diet every day". Some items are fairly subjective: "I am content with myself generally speaking." Another questionnaire, the 16-item Diabetes Self-Management Questionnaire (DSMQ), reported as "reliable and valid", was studied in 261 hospitalized patients yielding a correlation of –0.23 with HbA_{1c} [8]. The authors noted that "study participants cannot be rated as representative of the general diabetic population, which limits the generalizability of results" [8]. Some items, for example, "Check blood sugar levels frequently," appear to be not in line with current evidence for patients not on insulin [19]. An 18-item questionnaire, designed specifically as a "research tool," was tested among 252 individuals resulting in a correlation of –0.27 with HbA_{1c} [20]. Generalizability is limited by certain items, such as "Maintain healthy diet during financial difficulties." Other items appear non-specific such as "Prevent low blood sugar" and "Prevent high blood sugar". The Personal Diabetes Questionnaire (PDQ) is comprehensive (spanning 14 pages) but also quite complex and time intensive, requiring 20 to 30 minutes to complete [6]"page":"321–332","volume":"91","issue":"3","source":"ScienceDirect","abstract":"Aim\nTo develop and evaluate the validity and reliability of The Personal Diabetes Questionnaire (PDQ. The questions are verbose and require patients to comprehend some fairly complicated choices. Many of the items serve as information gathering; yet there are no items for tobacco use. This lengthy questionnaire achieved a mild correlation of .21 with HbA_{1c}. Its generalizability is limited due to sampling of predominantly well-educated patients, as well as the use of regional colloquial words. The Summary of Diabetes Self-Care Activities (SDSCA) has multiple versions and complex scoring instructions with subscales that require separate interpretation. It appears to encourage multiple daily blood glucose testing by giving higher scores regardless of clinical indication. Items are somewhat convoluted ("On average, over the past month, how many days per week have you followed your eating plan?") and arbitrary ("On how many of the last seven days did you inspect the inside of your shoes?"). Additional items are information gathering type and some require complex judgement calls on part of the patient.

In contrast, a representative sample was obtained in our study with a broad range of age, gender, occupations, duration of diagnosis and glycemic control. The high readability (Flesch Readability score, 90) of the Diabetes Score makes it among the easiest-to-read diabetes scales. With just 10-items on a single page, the questionnaire is simple to score and relatively straightforward to interpret. These distinguishing features support its use as a clinical, shared decision-making intervention and not just as a research tool.

The Diabetes Score questionnaire items showed moderate internal consistency and reliability in our study. The correlation with HbA_{1c} and random blood glucose (similar to other validated questionnaires) supports concurrent validity and its use in clinical settings. It is pertinent to point out that validation of any questionnaire is limited to the version studied in the research context [10]. Many diabetes questionnaires were modified later on, with updated versions substantially different from the originally validated ones [21]. In our extensive literature search, none of the studies reported long-term patient-oriented outcomes.

Diabetes Score showed evidence of construct validity through factor analysis indicating well separated diet and exercise subscales. Study participants with higher Diabetes Scores tended to be generally healthier with better glycemic control. Limited correlation with blood glucose levels indicated that while higher Diabetes Scores are associated with better glycemic control, the questionnaire gathers additional information not captured by HbA_{1c}.

Limitations of our study include lack of longitudinal follow-up, and the absence of children or patients with type 1 diabetes. The Diabetes Score questionnaire does not measure healthcare professionals' counselling skills. Furthermore, the questionnaire does not individualize dietary or exercise recommendations. The item on avoidance of sweet foods oversimplifies the concept of carbohydrate counting but is supported by recommendations to consume low-glycemic index foods [22]. To some extent, these factors are balanced by the simplicity and clinical utility of the questionnaire.

Conclusions

The 10-item Diabetes Score questionnaire is a reliable and valid questionnaire to assess adherence to lifestyle recommendations in adult patients with type 2 diabetes. Individuals with type 2 diabetes may potentially benefit from using the Diabetes Score questionnaire for behavior modification. By allowing patients to reflect upon their dietary intake and physical activity, the Diabetes Score allows a more mindful approach to setting lifestyle targets. Its initial

psychometric properties measured in this study reveal a mild correlation with glycemic control, fair reliability, reasonable evidence of construct validity and moderate patient acceptance. The simplicity of the Diabetes Score makes it attractive as a patient discussion tool for improving self-management. It may help in refocusing on patients' lifestyles and reducing excessive emphasis on tight glycemic control [23].

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Statement of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Conflict of interest

Nothing to declare.

REFERENCES

1. Jalilian H, Pezeshki MZ, Torkzadeh L, et al. Health care seeking behaviors in type 2 diabetic patients in East Azerbaijan. Clinical Diabetology. 2019; 8(6): 292–302, doi: 10.5603/dk.2019.0031.
2. Brzeziński M, Korzeniowska K, Szarejko K, et al. "PoZdro!" as an example of a successful multicenter programme for obesity management and healthy lifestyle promotion in children and adolescents - programme protocol and preliminary results from the first intervention site. Pediatr Endocrinol Diabetes Metab. 2020; 26(1): 22–26, doi: 10.5114/pedm.2020.94393, indexed in Pubmed: 32418419.
3. McGowan P. The challenge of integrating self-management support into clinical settings. Can J Diabetes. 2013; 37(1): 45–50, doi: 10.1016/j.jcjd.2013.01.004, indexed in Pubmed: 24070748.
4. Tang TS, Funnell MM, Sinco B, et al. Peer-Led, Empowerment-Based Approach to Self-Management Efforts in Diabetes (PLEASED): A Randomized Controlled Trial in an African American Community. Ann Fam Med. 2015; 13 Suppl 1: S27–S35, doi: 10.1370/afm.1819, indexed in Pubmed: 26304969.
5. Vallis M. Are Behavioural Interventions Doomed to Fail? Challenges to Self-Management Support in Chronic Diseases. Can J Diabetes. 2015; 39(4): 330–334, doi: 10.1016/j.jcjd.2015.01.002, indexed in Pubmed: 25837809.
6. Stetson B, Schlundt D, Rothschild C, et al. Development and validation of The Personal Diabetes Questionnaire (PDQ): a measure of diabetes self-care behaviors, perceptions and barriers. Diabetes Res Clin Pract. 2011; 91(3): 321–332, doi: 10.1016/j.diabres.2010.12.002, indexed in Pubmed: 21215487.
7. Uchmanowicz I, Krzemińska S, Ausili D, et al. Polish adaptation of the self-care of diabetes inventory (SCODI). Patient Prefer Adherence. 2020; 14: 1341–1350, doi: 10.2147/PPA.S253444, indexed in Pubmed: 32801664.
8. Schmitt A, Gahr A, Hermanns N, et al. The Diabetes Self-Management Questionnaire (DSMQ): development and evaluation of an instrument to assess diabetes self-care activities associated with glycaemic control. Health Qual Life Outcomes. 2013; 11: 138, doi: 10.1186/1477-7525-11-138, indexed in Pubmed: 23937988.
9. Hashim, MJ. Diabetes Score - a new behaviorally-oriented questionnaire for assessing and improving patient adherence. In: American Association of Clinical Endocrinologists Gulf Chapter 3rd Clinical Conference. Dubai; 2015.
10. Keszei AP, Novak M, Streiner DL. Introduction to health measurement scales. J Psychosom Res. 2010; 68(4): 319–323, doi: 10.1016/j.jpsychores.2010.01.006, indexed in Pubmed: 20307697.
11. Ryan P, Sawin KJ. The Individual and Family Self-Management Theory: background and perspectives on context, process, and outcomes. Nurs Outlook. 2009; 57(4): 217–225.e6, doi: 10.1016/j.outlook.2008.10.004, indexed in Pubmed: 19631064.
12. Mottalib A, Salsberg V, Mohd-Yusof BN, et al. Effects of nutrition therapy on HbA1c and cardiovascular disease risk factors in overweight and obese patients with type 2 diabetes. Nutr J. 2018; 17(1): 42, doi: 10.1186/s12937-018-0351-0, indexed in Pubmed: 29626933.
13. Franz MJ, Boucher JL, Rutten-Ramos S, et al. Lifestyle weight-loss intervention outcomes in overweight and obese adults with type 2 diabetes: a systematic review and meta-analysis of randomized clinical trials. J Acad Nutr Diet. 2015; 115(9): 1447–1463, doi: 10.1016/j.jand.2015.02.031, indexed in Pubmed: 25935570.
14. Longo DR, Schubert SL, Wright BA, et al. Health information seeking, receipt, and use in diabetes self-management. Ann Fam Med. 2010; 8(4): 334–340, doi: 10.1370/afm.1115, indexed in Pubmed: 20644188.
15. Schellenberg ES, Dryden DM, Vandermeer B, et al. Lifestyle interventions for patients with and at risk for type 2 diabetes: a systematic review and meta-analysis. Ann Intern Med. 2013; 159(8): 543–551, doi: 10.7326/0003-4819-159-8-201310150-00007, indexed in Pubmed: 24126648.
16. Irwig MS, Sood P, Ni D, et al. A diabetes scorecard does not improve HbA(1c), blood pressure, lipids, aspirin usage, exercise and diabetes knowledge over 9 months: a randomized controlled trial. Diabet Med. 2012; 29(9): 1206–1212, doi: 10.1111/j.1464-5491.2012.03610.x, indexed in Pubmed: 22332914.
17. Babyak MA, Green SB. Confirmatory factor analysis: an introduction for psychosomatic medicine researchers. Psychosom Med. 2010; 72(6): 587–597, doi: 10.1097/PSY.0b013e3181de3f8a, indexed in Pubmed: 20467001.
18. Chen CP, Peng YS, Weng HH, et al. Development and preliminary testing of a brief screening measure of healthy lifestyle for diabetes patients. Int J Nurs Stud. 2013; 50(1): 90–99, doi: 10.1016/j.ijnurstu.2012.09.001, indexed in Pubmed: 23010134.
19. Havele SA, Pfoh ER, Yan C, et al. Physicians' Views of Self-Monitoring of Blood Glucose in Patients With Type 2 Diabetes Not on Insulin. Ann Fam Med. 2018; 16(4): 349–352, doi: 10.1370/afm.2244, indexed in Pubmed: 29987085.
20. Wang ML, Lemon SC, Welch G, et al. Development and validation of the Lifestyle Self-Efficacy Scale for Latinos with Diabetes (LSESLD). Ethn Dis. 2013; 23(4): 428–435, indexed in Pubmed: 24392604.
21. Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. Diabetes Care. 2000; 23(7): 943–950, doi: 10.2337/diacare.23.7.943, indexed in Pubmed: 10895844.
22. Watanabe T, Berry TR, Willows ND, et al. Assessing intentions to eat low-glycemic index foods by adults with diabetes using a new questionnaire based on the theory of planned behaviour. Can J Diabetes. 2015; 39(2): 94–100, doi: 10.1016/j.jcjd.2014.09.001, indexed in Pubmed: 25439502.
23. Wojszel ZB, Kasiukiewicz A. A retrospective cross-sectional study of type 2 diabetes overtreatment in patients admitted to the geriatric ward. BMC Geriatr. 2019; 19(1): 242, doi: 10.1186/s12877-019-1256-2, indexed in Pubmed: 31477024.

Supplementary Appendix

Diabetes Score

What's your score?

	10 points	5 points	0 points
1. Vigorous exercise	At least 30 minutes daily 3 or more days a week	Less than 30 minutes daily Less than 3 days a week	Rarely or none
2. Activity level	Active (stairs, walks)	Mildly active	Sedentary (TV, computer, use lifts)
3. Daily home exercise	Doing daily	Irregular	Rarely or none
4. Simple sugars	Rarely eat sweets	Occasionally eat sweets	Frequent sweets
5. Whole grain	3-4 servings of whole grain	Rarely eat whole grain	Usually eat white bread or white rice
6. Portion control	Limit portion size and avoid second servings	Occasionally limit	Rarely or none
7. Fruits and vegetables	4-5 servings or pieces of fruits and raw vegetables	1-3 servings or pieces per day	Rarely or none
8. Health education	Regularly (dietician, support groups, books, websites, apps)	Occasionally	Rarely or none
9. Foot inspection	Daily	Weekly	Rarely or none
10. Doctor & medicines	3 or more visits a year to the same doctor Regular with medicines	1-2 visits a year Forgetting medicines frequently	Rarely or none Not taking 1 or more recommended medicines
Total score (❒ subtract 20 points if smoking cigarettes or using tobacco or drinking alcohol)			

Write your scores here

Score	Meaning	Date → Score↓							
80 – 100	Excellent								
60 – 80	Good								
60 – 40	Fair								
20 – 40	Not good								
0 – 20	Unhealthy								

My active lifestyle	**Walk daily.** Add an additional 1 minute of aerobic (fast brisk walk) exercise to your daily walk each week.
Monday Tuesday Wednesday Thursday Friday Saturday Sunday	Do home exercises such as arm stretches and lunges. Try: gardening, home cleaning, playing sports with children and friends. Use stairs instead of escalators. Limit TV, computers, electronic devices. Avoid sitting for long periods. Be active! **Be positive** – your attitude makes the difference. Smile. Think positive thoughts about yourself and the world – say positive words. Make friends with positive people

My meal plan	*Suggestions*
Breakfast	Fresh cut fruit, oatmeal, boiled egg, one slice of bread with vegetable oil spread (no jam or juice). Tea/coffee. Drink plenty of water.
Lunch	Salad, half-cup of rice with beans, vegetables, and seasonings. Eat four **small meals** through the day.
Snack	Green tea with a biscuit. **Reduce portion size** – eat in small amounts. Avoid second servings. Eat slowly and mindfully.
Dinner	Baked fish with steamed vegetables. A small piece of dessert. Almonds. Enjoy the taste of food. Pause between each bite.

My medicines
Morning
Afternoon
Evening

Green: All you can eat!	Water! Fresh vegetables, salads
Yellow: Eat in moderation	Cooked vegetables, beans, lentil, fish, fruits, brown bread
Red: Avoid or eat in small amounts	Rice, white bread, potatoes, meat, fried foods, pastry, nuts, desserts, jam, sweets, juice, soda