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ORIGINAL ARTICLE

ANALYSIS OF ENERGY AND MACRONUTRIENTS INTAKE IN PATIENTS WITH TYPE 1 AND TYPE 2 DIABETES MELLITUS: A PILOT STUDY

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ABSTRACT

Background. Diabetes mellitus (DM) is a metabolic disease characterized by impaired glycaemic control. We are familiar with the various types of DM and the different treatment options available. Nutrition is important for each type of DM.

Objective. The objective of this study was to calculate daily energy and macronutrient intake in people with DM using three-day dietary records.

Materials and Methods. A total of 40 people with type 1 (45%) or type 2 (55%) DM completed a three-day dietary record. Daily energy and macronutrient intake were assessed using the Planeat nutritional application. Statistical analyses were performed using the two-sample t-test assuming unequal variances and one-way analysis of variance (ANOVA), with statistical significance set at $p < 0.05$.

Results. The participants had a mean age of 48.33 ± 21.71 years, with an average body weight of 73.60 ± 22.07 kg and height of 168.43 ± 12.80 cm. Compared with the reference values, fasting plasma glucose, HbA1c and triacylglycerol concentrations differed significantly ($p < 0.001$), whereas no significant difference was observed for total cholesterol ($p > 0.05$). Dietary analysis showed lower intakes of carbohydrates (155.04 ± 50.49 g) and fats (59.94 ± 30.44 g), while protein intake remained within the recommended range (78.35 ± 31.94 g). Carbohydrates accounted for a lower proportion of total daily energy intake (43.03 ± 8.75%), whereas the contributions of fats (34.61 ± 9.39%) and proteins (22.36 ± 6.61%) were higher. However, none of these differences between the measured and recommended macronutrient intakes reached statistical significance ($p > 0.05$).

Conclusions. Medical nutrition therapy remains a key component of DM management. These findings emphasize the importance of individualized dietary counselling aimed at improving macronutrient balance, dietary quality, and patient education to support glycaemic control and reduce the risk of diabetes-related complications.

Keywords: *diabetes mellitus, treatment, nutrition, macronutrient intake, energy intake*

INTRODUCTION

Diabetes mellitus (DM) is a long-term disease that occurs when the body is unable to process and regulate blood glucose levels, either due to excessive insulin secretion from the pancreas or due to insulin being unable to regulate blood glucose levels [1]. DM is a chronic metabolic condition characterised by persistent hyperglycaemia caused by deficiencies in insulin synthesis or action [2]. The first and most common symptoms of DM are increased thirst (polydipsia), hunger, frequent urination, headache, blurred vision, fatigue, weight loss, skin infections and slow wound healing. These are all symptoms of long-term hyperglycaemia [3]. Diagnostic criteria for diabetes mellitus are the random plasma glucose ≥ 200 mg/dL (≥ 11.1 mmol/L) or the fasting plasma glucose ≥ 126 mg/dL (≥ 7.0 mmol/L) or the 2-hour oral glucose tolerance test (OGTT) value in venous plasma ≥ 200 mg/dL (≥ 11.1 mmol/L) or glycated hemoglobin (HbA1c) ≥ 6.5% (≥ 48 mmol/mol Hb) [4]. DM is classified into several clinical categories, although these are being reevaluated based on genetic, metabolomic and other characteristics and pathophysiology: type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), specific types of DM caused by other causes and gestational diabetes mellitus (GDM). T1DM is caused by autoimmune damage to pancreatic β cells, usually leading to absolute insulin deficiency, including latent autoimmune diabetes in adults (LADA). It accounts for 5-10% of all types of DM. T1DM most often occurs in children and young adults (< 35 years) [5].

The primary treatment option for T1DM is insulin replacement therapy. The current treatment regimen for T1DM involves combining an intensive diet with the

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lifelong administration of exogenous insulin, either via multiple daily injections or by using insulin pumps [6].

The growing number of obese people worldwide is one of the factors contributing to the increasing prevalence of T2DM [7]. T2DM is characterised by dysregulation of glucose metabolism, leading to hyperglycaemia. It is typically caused by insulin resistance and impaired insulin secretion, both of which result in impaired glucose tolerance [8]. More than 90 % of diabetes cases worldwide are T2DM. T2DM can be prevented and managed through education, lifestyle changes, necessary medication and other available treatments [7].

Medical nutrition therapy is an essential component of both diabetes management and self-management education [9]. The long-term goals of nutritional therapy for diabetics should be to achieve near-normal blood glucose levels without an excessive risk of frequent hypoglycaemia; to focus on cardiovascular health; to maintain a normal body weight; to prevent acute and chronic complications of diabetes; and to improve overall health and quality of life [10].

Monitoring carbohydrate intake is a key strategy for achieving normal blood glucose levels in people with T1DM and T2DM [9]. The glycemic index (GI) indicates how quickly and for how long an individual food will raise blood sugar levels in people without DM [11]. Foods are divided according to their GI: foods with a low GI raise blood sugar levels slowly (e.g. legumes, nuts, rye bread, white yogurt). Foods with a medium GI raise blood sugar level somewhat more quickly (e.g. boiled potatoes, parboiled rice, wheat bread). Foods with a high GI raise blood sugar level quickly (e.g. sweetened drinks, pastries, honey). People with DM should prefer foods with low or medium GI. High GI foods are good for hypoglycaemia [12]. For people with DM, the main goal of fat intake is to limit saturated fat and cholesterol intake [9]. People with DM should consume for fats containing monounsaturated and polyunsaturated fatty acids, including omega-3 [13]. Good sources of protein include milk and dairy products, legumes, eggs, fish, poultry, and lean meat [14].

The objective of this study was to calculate the daily energy intake, the daily intake of macronutrients and the average percentage of energy from macronutrients in diet of people with DM.

MATERIAL AND METHODS

Characteristics of the patients with DM

The study population comprised 40 individuals with DM from Slovakia. Study participants were recruited from a diabetes outpatient clinic and a diabetes association in Nitra. Nitra is a city located in the western part of Slovakia, in the Nitra Region, approximately 90 km east of the capital city, Bratislava. It lies in the Nitra Region, in the Danubian Lowland, at the foothills of the Tribeč Mountains. Of the participants, 45% were diagnosed with type 1 DM and 55% with type 2 DM. The sample included 15 men (37.5%) and 25 women (62.5%). The study cohort consisted of 4 children and 36 adults with diabetes mellitus. No age restrictions were applied during participant recruitment, allowing for the inclusion of a diverse study population.

Participants were eligible for inclusion if they had been diagnosed with type 1 or type 2 DM, were willing to participate in the study and provided written informed consent, were able to independently complete the questionnaire and maintain a food intake record and had a stable health status at the time of data collection. Of all patients with diabetes included in our pilot study, 23 were treated with insulin therapy, 20 received oral or other pharmacological antidiabetic medications, and 15 were managed through dietary interventions. Thus, the distribution of treatment modalities reflected the diversity of therapeutic approaches within the study population.

Participants were excluded if they (women) had GDM, a serious acute or chronic disease that could significantly affect dietary intake or metabolism (e.g., oncological, renal, or hepatic diseases), followed a specific therapeutic diet unrelated to diabetes (e.g., a diet for phenylketonuria), were using antibiotics at the time of data collection, or provided incomplete dietary records or questionnaires.

Data acquisition methods

Data were collected using an anonymous online questionnaire that included a three-day dietary record. The questionnaire was created and administered through Google Forms and consisted of 42 questions, including 15 closed-ended and 27 open-ended questions, with the latter also incorporating items from the dietary protocol.

The questionnaire was divided into two sections. The first section collected demographic information, anthropometric data (body weight and height), basic information regarding diabetes, selected biochemical parameters, and lifestyle characteristics. Current values of body weight and height, as well as selected biochemical blood parameters were obtained from participants' medical records with their informed consent. Following the calculation of BMI using the appropriate formula, BMI values were assessed separately for children and adults. In children, the calculated BMI values were subsequently plotted on percentile charts according to age and sex. Based on the corresponding percentile, children were classified into the following categories: underweight – BMI < 5th percentile; normal weight – BMI from the 5th to

< 85th percentile; overweight – BMI from the 85th to < 95th percentile; and obesity – BMI ≥ 95th percentile. In the adult participants of our pilot study, BMI was classified as follows: underweight – < 18.5 kg/m²; normal weight – 18.5-24.9 kg/m²; overweight – 25.0-29.9 kg/m²; and obesity – ≥ 30.0 kg/m². The second part focused on dietary habits. Dietary intake data were collected using a three-day dietary record, in which participants documented all consumed food and beverages, including portion sizes, during the selected days. Participants were instructed to record their intake for two randomly selected weekdays and one randomly selected weekend day. The dietary records included the following meals: breakfast, morning snack, lunch, afternoon snack, dinner, and an optional second dinner.

Data collection

Data collection was performed between November 2025 and February 2026. Participants received the questionnaire either electronically via email and social media platforms or in a paper-based format during in-person contact. The questionnaire for pediatric patients with diabetes mellitus was completed by a parent. The results of the blood tests were obtained from the patients' medical records with their informed consent. Blood samples were collected at the diabetology outpatient clinic attended by the patients. Blood was collected by venipuncture with the patients in a seated position, and the procedure was performed by qualified healthcare personnel. The blood samples were subsequently sent to a certified laboratory, where individual blood parameters were analyzed according to the requirements of the diabetologist. According to the DCCT methodology, the range of HbA1c is as follows: nondiabetics usually falls within the range of 4.0-5.6%, prediabetes usually has HbA1c levels of 5.7-6.5%, people with a glycated haemoglobin level of more than 6.5% have DM. As DM is associated with multiple complications, recommendations for individuals with the condition include maintaining HbA1c levels below 7.0% (DCCT) [15].

No nutritional counseling or dietary intervention was provided to participants during or after the study period.

Ethical considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki as revised in 2024 [16]. Ethical approval from an ethics committee was not required for this study. All participants provided informed consent for participation and for the use of data obtained from the questionnaire and dietary protocol. For participants who were children, informed consent was obtained from their parents or legal guardians.

Data analysis

The data collected from the questionnaires was evaluated statistically and graphically using Microsoft Office Excel 2010 (Los Angeles, Ca, USA). Energy and macronutrient intake were assessed individually for each participant using the Planeat nutritional application (this application is used to create personalised nutritional plans and is available in three versions, depending on the professional focus: Trainer, Nutritionist and Medical). The Planeat application includes a dedicated "Medical" version designed to support nutritional management in patients with specific medical diagnoses. The application can be used in various medical fields, including diabetology, obesity medicine, dietetics, gastroenterology, cardiology, nephrology, neurology, and oncology. It enables the assessment of dietary habits, including the intake of energy, macronutrients and selected vitamins and minerals, and allows other lifestyle factors, such as fluid intake, sleep patterns, and physical activity, to be taken into account. In addition, the application facilitates the development of individualized meal plans based on the patient's nutritional requirements, health status, and individual dietary preferences. Energy and macronutrient intake were assessed individually for each participant using the Planeat nutritional application, based on data obtained from the participants' nutritional protocols. Participant characteristics, including age, gender, body weight, height, body mass index (BMI), were entered into the application. Based on these data, the application automatically calculated individualized reference values for energy and nutrient requirements. The final analysis and summary of the results were based on the individually assessed dietary intake data of each participant. The data obtained from Planet were then evaluated statistically and graphically using Microsoft Office Excel 2010 (Los Angeles, Ca, USA). The levels of statistical significance were set at $p < 0.05$, $p < 0.01$ and $p < 0.001$. We used a t-test: two-sample assuming unequal variances for the statistical evaluation of biochemical parameters. We statistically evaluated the energy and macronutrient intake of patients with DM using one-factor analysis of variance (ANOVA). Given the nature of the variables studied and the objectives of the statistical analysis, the use of parametric methods (two-sample assuming unequal variances and one-way ANOVA) was considered appropriate. However, given the relatively small sample size, verification of the results using non-parametric methods may be warranted and should be considered in future research.

RESULTS

The final analysis included data from all 40 participants enrolled in the study. This section presents the demographic and anthropometric characteristics of the study population, with particular focus on age, gender distribution, body weight, height, and BMI values. The obtained results are summarized in Table 1. The average age of the participants was 48.33 ± 21.71 years (range: 7.00-96.00 years). The mean body weight and height were 73.60 ± 22.07 kg and 168.43 ± 12.80 cm, respectively. The average BMI was 25.65 ± 6.58 kg/m², corresponding to the threshold between the normal weight and overweight categories. Based on BMI classification, 5 participants (12.5%) were underweighted, 14 (35.0%) had normal weight, 12 (30.0%) were overweight, and 9 (22.5%) were classified as obese.

Table 2 presents the biochemical parameters of participants with DM. Reference values for the monitored biochemical parameters were as follows (normal/prediabetes/diabetes): FPG < 5.6/5.6-6.9/≥ 7.0 mmol/L; HbA1c < 39/39-47/≥ 48 mmol/mol (in percentage terms 4.0-5.6/5.7-6.5/> 6.5%). Normal values for TG and total cholesterol (for diabetes) were < 1.7 mmol/L and < 4.5 mmol/L, respectively [5, 15]. Their mean fasting glucose level was elevated (7.06 ± 1.70 mmol/L) and showed a highly statistically significant difference compared with the reference values ($p < 0.001$). The percentage distribution of fasting blood glucose values showed that 0% of diabetic patients fell below the reference range, 77.5% were within the normal range, and 22.5% were above the reference range. Similarly, triacylglycerol levels (1.08 ± 0.87 mmol/L) differed significantly from the reference values ($p < 0.001$). In the case of triacylglycerols, 27.5% of patients had values below the normal range, 65% within the normal range, and 7.5% above the normal range. A statistically significant difference was found in the HbA1c parameter (8.23 ± 1.34%) compared with the reference values ($p < 0.001$). In contrast, no statistically significant differences were observed for total cholesterol levels (4.30 ± 0.13 mmol/L) when compared with the respective reference values ($p > 0.05$). For glycated hemoglobin,

Table 1. Characteristics of DM patients

	average ± SD	min. – max.	med	mod
Age (yrs)				
All (n = 40)	48.33 ± 21.71	7.00 – 96.00	49.50	66.00
Men (n = 15)	44.73 ± 24.58	7.00 – 96.00	46.00	-
Women (n = 25)	50.48 ± 20.01	16.00 – 79.00	54.00	66.00
Body weight (kg)				
All (n = 40)	73.60 ± 22.07	23.00 – 138.00	70.00	70.00
Men (n = 15)	75.33 ± 25.47	23.00 – 112.00	77.00	-
Women (n = 25)	72.56 ± 20.25	51.00 – 138.00	68.00	70.00
Body height (cm)				
All (n = 40)	168.43 ± 12.80	115.00 – 198.00	168.00	175.00
Men (n = 15)	170.00 ± 18.40	115.00 – 190.00	175.00	175.00
Women (n = 25)	167.48 ± 8.13	155.00 – 198.00	165.00	165.00
BMI (kg/m^2)				
All (n = 40)	25.65 ± 6.58	15.00 – 47.00	25.00	23.00
Men (n = 15)	25.33 ± 6.40	15.00 – 37.00	25.00	23.00
Women (n = 25)	25.84 ± 6.81	17.00 – 47.00	25.00	25.00

Data are expressed as average ± standard deviation (SD); n – number of participants; min. – max.; med – median; mod – modus; BMI – body mass index.

Table 2. Biochemical parameters of DM patients

Biochemical parameters	DM patients (n = 40)			
	average ± SD	min. – max.	med	p-value
Fasting plasma glucose (mmol/L)	7.06 ± 1.70	4.50 – 12.00	6.80*	0.0000
HbA1c (%)	8.23 ± 1.34	4.30 – 10.50	6.85*	0.0002
Cholesterol (mmol/L)	4.30 ± 0.13	3.00 – 7.20	4.29	0.0726
TG (mmol/L)	1.08 ± 0.87	0.42 – 4.70	0.89*	0.0003

Data are expressed as average ± standard deviation (SD); n – number of participants; min. – max.; med – median; HbA1c – glycated haemoglobin; TG – triacylglycerols; these values are compared with the reference values; * statistically significant differences ($p < 0.05$).

2.5% of patients had values below the normal range, 37.5% had values within the normal range, and 60% had values above the normal range. The percentage distribution of total cholesterol values showed that 0% of diabetic patients had values below the reference range, 80% within the normal range, and 20% above the reference range.

Table 3 presents the energy intake (in kJ and kcal) and the macronutrient intake (in grams) based on three-day dietary records of participants with DM. The analysis of the three-day nutritional protocols revealed considerable variability in nutrient intake among participants with DM. Compared with the recommended values for individuals with DM, participants in this study consumed, on average, lower amounts of carbohydrates (155.04 ± 50.49 g/day) and fat (59.94 ± 30.44 g/day) than recommended. The percentage distribution of carbohydrate intake (g/day) was as follows: 85% of the patients monitored in our pilot study had an intake below the recommended level. An intake within the normal range was observed in 10% of diabetic patients, while an intake above the normal range was observed in the remaining 5%. The percentage distribution of fats intake (g/day) was as follows: 65% of the patients monitored in our pilot study had an intake below the recommended level. An intake within the normal range was observed in 15% of diabetic patients, while an intake above the normal range was observed in the remaining 20%. According to Gažarová et al. [17], the recommended daily intake of carbohydrates should range from 200 to 250 g, while fat intake should be approximately 80 g/day. The recommended protein intake is 1 g/kg/day, although a lower intake of 0.8 g/kg/day is also considered appropriate [17]. Based on the participants' body weight, the recommended protein intake was calculated individually for each participant. The average protein intake in this study was 78.35 ± 31.94 g/day, which was within the individually calculated recommended range. No statistically significant differences were observed between the participants' intake of individual macronutrients and the corresponding recommended values ($p > 0.05$).

Compared with the recommended values for people with DM, the proportion of total daily energy intake derived from carbohydrates was lower (43.03 ± 8.75%) than the recommended range of 45-60% [18]. In contrast, the proportions of total daily energy intake derived from fats (34.61 ± 9.39%) and proteins (22.36 ± 6.61%) were higher than the recommended ranges of approximately 20-30% and 15-20%, respectively [11]. However, no statistically significant differences were observed between the observed and recommended values for any of the three macronutrients ($p > 0.05$).

Table 4 presents the percentage contribution of macronutrients to total energy intake based on three-day dietary records of participants with DM. Compared with the recommended values for individuals with DM, the percentage of total daily energy intake from carbohydrates was lower (43.03 ± 8.75%) than the recommended value. Conversely, the percentage of energy intake from fats (34.61 ± 9.39%) and proteins (22.36 ± 6.61%) was higher than recommended. No statistically significant differences were observed for any of the three macronutrients ($p > 0.05$).

Table 3. Energy and macronutrients intake from 3 days in patients with DM

Energy and macronutrients	DM patients (n = 40)			
	average ± SD	min. – max.	med	p-value
Energy (kJ; kcal)	6360.83 ± 2109.21; 1520.27 ± 504.11	3170.00 – 11393.33; 757.65 – 2723.07	5999.50; 1433.91	0.9981
Carbohydrates (g)	155.04 ± 50.49	55.67 – 285,33	154.00	0.4681
Fats (g)	59.94 ± 30.44	17.67 – 147.33	54.00	0.8061
Proteins (g)	78.35 ± 31.94	24.00 – 159.67	73.00	0.8610

Data are expressed as average ± standard deviation (SD); n – number of participants; min. – max.; med – median these values are compared with the reference values.

Table 4. Percentage (%) macronutrients intake from 3 days in patients with DM

Macronutrients	DM patients (n = 40)			
	average ± SD	min. – max.	med	p-value
Carbohydrates (%)	43.03 ± 8.75	23.67 – 64.33	42.33	0.1827
Fats (%)	34.61 ± 9.39	16.67 – 57.00	34.67	0.6092
Proteins (%)	22.36 ± 6.61	10.67 – 40.67	22.00	0.3780

Data are expressed as average ± standard deviation (SD); n – number of participants; min. – max.; med – median; these values are compared with the reference values.

DISCUSSION

DM is a chronic disease characterised by elevated blood glucose concentrations. It is a major risk factor for cardiovascular disease, as well as increasing the risk of mortality and morbidity [19].

Glycated haemoglobin (HbA1c) values represent average glycaemic control over the previous two to three months [20]. In our study, the mean HbA1c concentration was 8.23 ± 1.34%, indicating suboptimal glycaemic control in the study population. This finding is comparable to that reported by Russo et al. [21], who observed a mean HbA1c value of 8.40%. The comparable HbA1c levels suggest that inadequate glycaemic control remains a relevant issue among people with DM, despite differences in dietary patterns and lipid parameters. In contrast to the HbA1c findings, our participants demonstrated a more favourable lipid profile than that observed by Russo et al. [21]. Mean total cholesterol and triglyceride concentrations in our cohort were 4.30 ± 0.13 mmol/L and 1.08 ± 0.87 mmol/L, respectively, compared with 4.85 mmol/L and 1.62 mmol/L, respectively, in the study by Russo et al. [21]. Although these differences may indicate better lipid control in our study population, they should be interpreted cautiously, as lipid concentrations are influenced by several factors, including pharmacological treatment, dietary intake, physical activity, body composition, and diabetes duration. Moreover, differences in patient characteristics and treatment strategies between the two studies may have contributed to the observed variation. Current recommendations emphasise that glycaemic and lipid targets should be individualised according to factors such as age, duration of diabetes, comorbidities, treatment regimen, and the risk of complications. Nevertheless, achieving adequate glycaemic and lipid control remains an important component of reducing the risk of both microvascular and macrovascular complications [17, 22].

A diabetic diet is a lifelong measure. The basis of a diabetic diet should be a varied and balanced diet to support maintaining an appropriate weight. The main food groups provide all the necessary nutrients, including carbohydrates, fats, proteins, vitamins, minerals and fibre. The recommended daily division of the diet is into six meals [12, 23]. The total daily energy intake should be sufficient to achieve and maintain the desired body weight. Most patients with type 2 DM are overweight or obese. Therefore, the main goal is to lose weight by reducing daily calorie intake [10, 13]. There is no clear evidence on the ideal amount of carbohydrates, fats and proteins that people with DM should consume. However, general recommendations for therapeutic nutrition in diabetes are as follows: the amount of carbohydrates should be between 200-250 g per day, the amount of fat should be approximately 80 g, and the recommended dose of protein should be 1 g/kg, or a lower value of 0.8 g/kg is also recommended [22, 23].

In our study, the distribution of macronutrient intake differed from that reported by Farooqi et al. [22]. Participants in our cohort consumed lower mean amounts of carbohydrates and fat but a higher mean amount of protein. Farooqi et al. [24] reported mean daily intakes of 230.6 g of carbohydrates, 66.1 g of fat, and 68.1 g of protein. These differences may reflect variations in dietary habits, cultural patterns, energy requirements, body composition, treatment characteristics, or other population-specific factors.

The proportion of energy derived from carbohydrates in our study was 43.03 ± 8.75%, which was similar to the 44% reported by Li et al. [25]. This value is within or close to the range generally reported for carbohydrate intake among adults with DM (45-60%), although the optimal proportion should not be considered universal. Contemporary nutritional recommendations emphasise that carbohydrate intake should be individualised according to dietary preferences, metabolic goals, medication, physical activity, body weight, and individual glycaemic response [18, 26]. Thus, the similarity between our findings and those of Li et al. [25] suggests a comparable relative contribution of carbohydrates to total energy intake in the two study populations. However, carbohydrate proportion alone does not reflect carbohydrate quality, including the intake of dietary fibre, whole grains, fruits and vegetables, as well as refined carbohydrates, all of which may influence metabolic outcomes.

In contrast, fat accounted for approximately 34.61 ± 9.39% of total daily energy intake in our study, which was comparable to the proportion reported by Li et al. [25] but higher than the 20-30% range recommended in some dietary guidelines [11]. This finding may suggest that dietary fat intake warrants particular attention in our study population. This negative trend in fat intake is of particular concern in people with DM, as excessive fat consumption may contribute to elevated blood lipid concentrations (hyperlipidaemia) and is associated with cardiovascular disease and stroke, which are complications of DM [27]. However, the total amount of dietary fat should not be considered independently of its quality, as the type of fat consumed, particularly the balance between saturated and unsaturated fatty acids, also plays an important role in lipid metabolism and cardiovascular risk. Therefore, nutritional interventions should focus not only on limiting excessive fat intake but also on improving dietary fat quality by favouring unsaturated over saturated fatty acids.

The recommended protein intake generally accounts for approximately 15-20% of total daily energy intake [28]. Li et al. [25] reported that protein contributed 17% of daily energy intake among people with DM, which was within the recommended range. In contrast, protein contributed a higher proportion of daily energy intake in our study (22.36 ± 6.61%). Although this intake was higher than that reported by Li et al. [25], the clinical significance of this difference should be interpreted cautiously, as protein requirements may vary depending on individual characteristics, including age, body weight, nutritional status, and the presence of chronic kidney disease. Therefore, protein intake should be appropriately individualised, particularly in people with DM who have impaired renal function [29].

From a DM perspective, making the right food choices helps to maintain long-term health, has a therapeutic and preventive effect, and helps to control blood sugar levels, blood fats, blood pressure, and body weight. It also promotes the efficient use of insulin and ensures the body receives the necessary vitamins and minerals. A nutritional approach should be tailored to the individual, taking into account their personal preferences, socioeconomic status, cultural background and comorbidities [29, 30].

Strengths and limitations of the study

A major strength of this study is its focus on current issues related to nutrition, which represents an integral component of diabetes mellitus (DM) management. Another important advantage is the detailed analysis of patients' dietary intake, providing valuable insights that may be applicable in clinical practice. Furthermore, the use of standardized software for dietary assessment (Planeat) ensured consistent and uniform processing of the collected data.

The main limitations of this study include the relatively small sample size (n = 40), which may limit the generalizability of the findings. The sample size was based on the availability of eligible participants, and no formal sample size calculation was performed. Another limitation is the unequal gender distribution, which may have affected the results due to differences in metabolic parameters, dietary habits, and body composition between men and women. In addition, the use of participant-reported data on food intake, body weight, and other variables (obtained from their medical records) may have introduced bias due to potential inaccuracies in reporting and estimation.

CONCLUSIONS

Although the overall dietary intake of the participants was generally consistent with current nutritional recommendations, the observed imbalance in the relative contribution of macronutrients suggests that dietary habits remain suboptimal among many people with DM. These findings underscore the need for individualized nutritional counselling that addresses not only total energy intake but also the quality and distribution of macronutrients in accordance with current evidence-based recommendations.

Regular dietary assessment should be incorporated into routine diabetes care, as it may help identify inappropriate dietary patterns, optimize metabolic control, and reduce the risk of long-term diabetes-related complications. A personalized nutritional approach, combined with ongoing patient education and lifestyle modification, remains essential for achieving optimal glycaemic control and improving overall health outcomes in people with DM.

Future studies involving larger and more diverse populations are warranted to confirm these findings and further elucidate the relationship between dietary intake, metabolic control, and long-term clinical outcomes. Nevertheless, the findings of this pilot study highlight the important role of nutritional therapy as an integral component of diabetes management.

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Conflict of interest

All authors declare that they have no conflict of interest.

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