The importance of nutrition education for diabetics – type 1 versus type 2 diabetics

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THE IMPORTANCE OF NUTRITION EDUCATION FOR DIABETICS – TYPE 1 VERSUS TYPE 2 DIABETICS

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ABSTRACT

Nutrition education is an integral part of the diabetic therapy that aims at achieving good glycaemic control to prevent complications. This is very important for type 1 diabetics (DMT1), where nutrition and insulin therapy must be matched. The aims of the study were: the evaluation of differences in nutrition education between DMT1 and type 2 diabetics (DMT2), the influence of education on glycaemic control and diet quality, and the self-assessment of health-related quality of life. A descriptive study was conducted on patients with DMT1 (n=101) and DMT2 (n=90) from Croatia using a study-specific questionnaire. Diet quality did not differ significantly between DMT1 and DMT2 patients. However, 18.0% of DMT1 and 20.0% of DMT2 patients do not possess adequate knowledge of the diabetic diet, nor stick to relating nutritional guidelines. Poor glycaemic control had 48.5% of DMT1 and 73.5% of DMT2 patients ($p<0.001$). Psychophysical health is better among the DMT2 patients ($p<0.001$), while the DMT1 patients have a better social life ($p=0.015$) and the overall quality of life ($p<0.001$). The results show that diabetics have poor nutrition knowledge, clearly showing the need for professional, continuous nutrition education. Education would help diabetics in improving their quality of life and glycaemia control, which decreases disease complications.

Keywords: diabetes type 1, diabetes type 2, diet quality, glycaemia control, quality of life

INTRODUCTION

Diabetes mellitus (DM) is a life-long metabolic disorder of carbohydrates, proteins and fats which leads to state of hyperglycemia. The global prevalence of DM in 2015 was 8.8%, and the positive trend continues (IDF, 2015). Uncontrolled hyperglycaemia is an underlying cause of a wide range of micro- and macrovascular complications. Today, more than two-thirds of deaths in diabetics are linked to cardiovascular diseases (Low Wang et al., 2016).

DM type 1 (DMT1) is characterized by an autoimmune destruction of β cells of the pancreas resulting in insulitis, inflammatory infiltration of the islets of Langerhans (In't Veld, 2011). Consequently, insulinopenia develops, i.e. major reduction

(around 80%) or complete absence of insulin synthesized in the pancreas. Symptoms are hyperglycemia, polyuria, polydipsia, sudden loss of weight, dehydration with consequent electrolyte disturbance, and ketoacidosis. Disease has acute start and develops within a couple of days or weeks. It affects predominantly young people till the age of 30, but the highest incidence is between the ages of 10 and 14, with no gender differences in frequency (Poljičanin et al., 2015; Stipančić et al., 2012).
Conversely, DMT2 is a polygenetic group of disorders, characterized by hyperglycemia due to disturbance in insulin secretion and/or its effect on target cells in the body, which results in a decreased number of glucose transporters (i.e. peripheral resistance) (Tripathi and Srivastava, 2006). The disease develops gradually, mainly affects older adults (from 45 years of age and older) (IDF, 2015) and it usually takes 9-12 years from the onset of the disease to its diagnosis (Harris et al., 1992). At diagnosis, about 50% of beta cell function is lost and symptoms include hyperglycemia, polyuria, polydipsia, dehydration with consequent electrolyte disturbance, fatigue, blurred vision, a high rate of infections and hyperosmolar hyperglycemic non-ketotic syndrome (Vijan, 2015). Unlike DMT1, obesity represents a major risk factor in DMT2; at diagnosis, up to 88% of DMT2 patients are overweight or obese (Wilding, 2014).The main diagnostic and treatment success criteria is glycated hemoglobin, HbA1c. This is a fraction of hemoglobin on which glucose in the bloodstream naturally attaches regardless of insulin and reflects average blood glucose levels over duration of 2-3 months (IDF, 2015).
The treatment puts the main focus on self-management and starts with education about the disease itself, oral medications and/or insulin, principles of the diabetic diet and the importance of regular physical activity (ADA, 2015). The only and major difference in the treatment protocol between DMT1 and DMT2 is in the type of the medicament therapy due to differences in disease etiology, progression and later prognosis (ADA, 2015; Vrca Botica et al. 2012; Kokić et al., 2011). Basic treatment principles are the adjustment of the dietary and lifestyle habits aiming to achieve and maintain good glycaemia control , consequently preventing and delaying micro- and macrovascular complications (ESC/EASD, 2013) in order to maintain good quality of life and prolong life expectancy (ADA, 2015). In order to achieve these goals, continuous, professional education is considered crucial (ADA, 2015; IDF, 2015).
The aim of the study was to evaluate the differences in nutrition education between DMT1 and DMT2 patients, and to determine the influence of education on glycaemic control, diet quality, and the self-assessment of health-related quality of life.

SUBJECTS AND METHODS

A descriptive study was conducted on patients with DMT1 (n=101) and DMT2 (n=90) from Croatia using a study-specific questionnaire. The questionaire was anonymous, and participants were asked to complete it only once. DMT1 patients were recruited via an online form (using open source Google Forms) and parents provided the information for the underaged children. DMT2 patients were recruited in pharmacies across the Osijek-Baranja region.

Questionnaire

The questionnaire consisted of three parts and it was developed on the basis of the previous research experience and guidelines for the treatment of DMT1 and DMT2 (IDF, 2012; 2017; ADA, 2015).
The first part of the questionnaire included questions about general and socio-economic characteristics, e.g. age, gender, body mass, body weight, education, monthly income per person, etc. The participants' self-reported current body mass and height were then used for the calculation of the body mass index (BMI). Calculated BMI was used to categorize participants according to their state of nourishment (WHO, 2006).
The second part of the questionnaire included questions about diagnosis, course of the disease and the treatment. Glycaemic control was considered good if glycated haemoglobin (HbA1c) was ≤6.5% or fasting blood glucose was ≤7.0 mmol/L (IDF, 2012; 2017; ADA, 2015).
Three questions in a form of a visual-analogue scale examined participants' subjective assessment on how much diabetes affects their social life (SocL), psychophysical health (PsH) and quality of life (QoL). The participants were asked to place a vertical line on the scale which was measured with a ruler, counted and transfered into a score. The score ranged from 0 to 100, and higher scores correlated with better aspects of life.
The third part of the questionnaire assessed the quality of the diet through a set of questions that encompassed all aspects of the diabetic diet and scored according to the current recommendations for diabetics (IDF, 2012; 2017; ADA, 2015). Questions were set as a multiple choice questions and only one answer could be given for each question. Each answer was assigned from 1 (the least preferred habit) to 5 points (the most preferred habit). The points were summed and gave the overall score, ranging from 25 to 125. Higher overall score correlated with a better diet and lifestyle habits.

Statistical analysis

Statistical analysis was performed by software Statistica (v. 13.3, StarSoft Inc., USA), with the level of significance p=0.05. Normality of the data distribution was tested by the nonparametric Kolmogorov-Smirnov test for the comparison of medians and arithmetic mean, and histograms plotting. Categorical data are presented as absolute and relative frequencies, while for numerical data median and interquartile range is used using descriptive statistical methods. For the comparison of categorical data within and between groups Fischer's exact test was used. The differences between two independent groups were tested with Mann-Whitney U Test.

RESULTS AND DISCUSSION

The study encompassed 101 DMT1 patients, mean age 25.0 ± 8.9 years (6 to 50 years, 22.8% males, 77.2% females) and 90 DMT2 patients, average age 68.0 ± 9.4 years (46 to 87 years, 46.0% males and 54.0% females).
As previously emphasized, the ultimate goal of nutrition education is to teach a diabetic how to independently regulate disease in order to manage everyday life activities without the risk of developing acute or chronic complications (Kokić et al., 2011). All

complications significantly alter the quality of life of diabetics and reduce life expectancy (DCCT, 1993; Nathan, 2014; Pacilli et al., 2016).
Although there was no difference in the quality of the diet or the level of education between DMT1 and DMT2 patients (Table 1), previous studies show that education on nutrition is necessary to improve control of glycaemia in both DM types (Baretić et al, 2017; Badruddin et al., 2002). However, 18.0% of DMT1 and 20.0% of DMT2 patients do not possesss adequate knowledge of the diabetic diet, nor stick to relating nutritional guidelines. Poor glycaemic control was found in 48.5% of DMT1 and 73.5% of DMT2 patients ($p<0.001$, Table 1). The same findings have been reported by the other authors (Badruddin et al., 2002; Gerstl et al., 2008).

Table 1. Glycaemia control, diet quality and the level of nutrition education between DMT1 and DMT2 patients

Characteristics of diabetics		**Diabetes mellitus type**		**p**
		Type 1	**Type 2**	
Diet quality (points)[+]		71.3 (66.3 – 76.3)	73.6 (68.0 – 77.6)	0.057[*]
Nutrition education[++]	Well educated	82 (82.0)	72 (80.0)	0.433[**]
	Not educated	18 (18.0)	18 (20.0)	
Glycaemia control[++]	Good[1]	52 (51.5)	18 (26.5)	*0.001*[**]
	Bad[1]	49 (48.5)	50 (73.5)	

[+]median (25 % - 75%); [++]n (%); [1]According to the recommended levels for HbA1c level, i.e. fasting blood glucose; *Mann-Whitney U test; **Fischer's exact test; statistical significance at $p<0.05$

The results of this research show the need for education on nutrition by a nutritionist/dietitian (for uneducated diabetics), but also for re-education of DMT1 and DMT2 diabetics due to our findings of their poor glycaemia control (Table 1). This becomes even more important if we know that 82% of DMT1 and 80% of DMT2 diabetics were educated, but almost half of DMT1 and tree quarters of DMT2 diabetics do not achieve recommended HbA1c levels (Table 1). Basic principles of education on nutrition for diabetes include setting up a regular meal pattern with consistent caloric and carbohydrate intake, while the number of meals itself depends on oral and/or insulin therapy (3-5 meals per day) (ADA, 2008.; Kokić *et al.,* 2011). Overall energy intake should be adjusted to a goal regarding patients weight reduction or control (Wheeler, 2012.). Even though the ideal diet for diabetic patients remains to be determined on an individual level, certain general guidelines should be followed no matter what regime is in place (Gingras et al., 2015; Delahanty et al., 2009; ADA, 2015).
DMT2 patients have better psychophysical health than DMT1 patients ($p<0.001$), while DMT1 patients have better social life ($p=0.015$) and the overall quality of life ($p<0.001$) in comparison to DMT2 patients (Figure 1). DMT2 patients have better PsH because they were diagnosed with DM at an older age when they were capable of comprehending the challenges of the diseases. Also, as the diseases progresses, the quality of life and social aspects of life inevitably worsenes. On the other hand, for young children diagnosed with DMT1 the most of the burden is taken by their parents/care-takers by the time they reach adolescence. As long as parents have some control, the disease will not affect the quality of life in DMT1 diabetics.

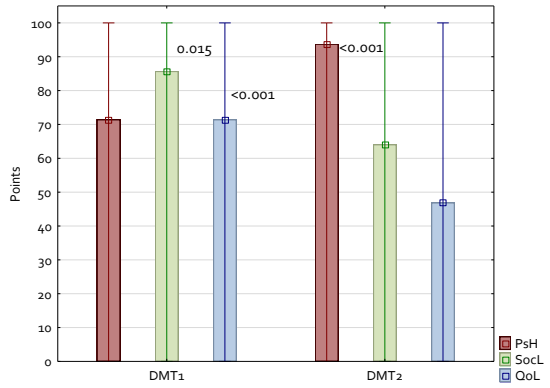

Fig. 1. The self-assessment on the level of influence diabetes has on three dimensions of life between DMT1 and DMT2 patients (Mann-Whitney U Test; statistical significance at $p<0.05$)

The quality of life in diabetics is most significantly affected by awareness of the complications and risk-factors of diabetes (Kalda et al., 2008; da Costa and Vieira, 2015).
In general, adolescents are more resistant to accepting the disease than younger children because they no longer depend on their parents or guardians for care and are responsible for their own health. Psychosocial issues also influence the behaviour of adolescents, reflecting their attitudes towards diabetes. Hormonal alterations, immaturity, difficulties in acquiring autonomous control, and a low rate of disease acceptance may hinder the daily control of blood glucose levels (da Costa and Vieira, 2015). For DMT2 patients, patient's age, duration of the disease, and patient's BMI significantly correlate with the quality of life (Kalda et al., 2008). Additionaly, obese DMT2 patients, especially females, experience anxiety or depression in comparison to their counterparts of a normal weight (Svenningsson et al., 2012). Also, diabetics with developed cardiovascular complications (i.e. hyperlipidemia and heart diseases) had significantly worse social functioning, physical functioning and mental health (Kazemi-Galougahi et al., 2012).

CONCLUSIONS

The results show that diabetics have poor nutrition knowledge, clearly showing the need for professional, continuous nutrition education. Education would help diabetics in improving their quality of life and control of glycaemia, consequently decreasing the burden of the disease (fewer complications).

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