

## **INFLUENCE OF EDUCATION ON BODY WEIGHT REDUCTION**

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### **Summary**

Elevated body mass is an important risk factor of many diseases like hypertension, diabetes, hyperlipidaemia, coronary heart disease etc. To reduce body weight various medicament, surgical, behavioural, dietetic and other approaches and methods are used. Education of patients is one of the key points in success, and besides solely implementation it is often used in combination with other methods. The aim of this study was to determine the influence of education in overweight and obese healthy and sick patients on the weight reduction. Study was conducted on the sample of 77 participants of which 39 were overweight and obese but otherwise healthy, 9 were patients with hypertension, 8 were diabetics, 11 patients with gastrointestinal problems and 10 patients with food allergies. During the study observation period all participants were educated on the importance of balanced nutrition via the flyer, weekly menu and individual interview. The observation period was 3 months per person. Basic anthropometric measurements were conducted and BMI calculated for each participant at the beginning and at the end of the observation period. Average reduction in BMI was 3.26 units in overweight and obese but otherwise healthy participants, 3.40 units in patients with hypertension, 5.08 units in diabetics, 0.12 units in patients with gastrointestinal problems and 0.10 in patients with food allergies. Greatest average reduction in BMI was noticed in diabetics. Education on balanced diet and healthy lifestyle via the flyer, weekly menu and individual interview resulted in significant body mass reduction in healthy as well as in patients with diagnosis. Education of overweight and obese persons could be an important tool in weight management programs.

**Keywords:** obesity, body weight, hypertension, diabetes, allergies, gastrointestinal diseases, education, body weight reduction

### **Introduction**

Balanced diet, physical activity and optimal body weight are important prerequisites in wellbeing and health promotion of each person.

In assessment of the status of the nourishment simple anthropometric measurements like body weight and height from which body mass index (BMI) is calculated, skin fold and muscles circumference, waist circumference, underwater weighing, bioelectrical impedance and other similar techniques are used (Jašić, 2008). The most often used criterion is BMI. According to the BMI, persons with values between 25 and 30 are considered as overweight, those with values

between 30 and 35 as obese, while values above 35 imply morbid obesity (Metelko, 2012).

According to the data from the World Health Organization (WHO) 1.5 billion people is overweight and more than 500 million of them are obese. Furthermore, projections indicate continuous raise in those numbers in the future period (Medanić and Pucarín-Cvetković, 2012; Ng et al., 2014).

36.9 % of males and 38.0 % of women globally is overweight or obese. Prevalence of overweight and obesity is higher in developed than in undeveloped and transitional countries, but the continuous raise trend is visible in both of them. According to estimations cumulative number of

obese and overweight adults in Bosnia and Herzegovina is 57.3 % in males and 51.9 % females, while obese rates are 15.4 % in males and 20.4 % in females (Ng et al., 2014). Health expenses due to the obesity caused problems in Europe contribute with 7 % to total health costs which is the same as the costs of the all carcinoma types together (Wilborn et al., 2005).

WHO defines obesity as a disease in which excess fat is accumulated to an extent that health may be adversely affected (Poirier et al., 2011). Obesity is a public health problem correlated with risk factors for the development of diseases like elevated blood pressure, diabetes, heart diseases, dyslipidaemia, some carcinoma types, infertility, spine diseases, skin infections, ulcers, gall stone and others (Steinberger and Daniels, 2002; Wilborn et al., 2005; Gomes et al., 2010; SIGN, 2010; Wiltink et al. 2013). By reducing body weight symptoms of those diseased are reduced as well as the risk of their development (SIGN, 2010).

Patient education is one of the possible approaches and one of the most efficient methods in body weight reduction.

Healthy weight reduction demands professional diagnostics of underlying overweight causes, nourishment status assessment as well as the evaluation of other risk factors like socioeconomic status, employment, marital status etc. Individualisation of diet based on patient's dietary needs, preferences and habits is very important for healthy weight reduction. All nutrients have to be represented in adequate amounts and gained from foods of low caloric value but with high shares of vitamins, minerals, dietary fibres and phytochemicals, e.g. high nutritional density foods (Mahan et al., 2008). Additionally, weight reduction diets which alter macronutrient contribution to the total energy intake should be avoided due to their potentially negative effects on health. For example, long term high protein diet can cause ketoacidosis, kidney and liver diseases, and bone mass reduction (Štimac and Turk, 2008).

Nutritional planning encompasses compiling the list of foods and meals for one or more days in line with dietary needs of a person (Šatalić and Alebić, 2008).

Physical activity varies in types and intensity among persons. To describe physical activity of a person metabolic equivalents (MET) are used. MET represents the ratio of work metabolic rate to a standard resting metabolic rate of 1 kcal/kg/h. 1 MET is considered a resting metabolic rate obtained during quiet sitting. In comparison to quiet sitting, moderate physical activity takes 3-6 MET and vigorous physical activity more than 6 MET (Ainsworth et al., 2005). Precise energy needs of each physical activity type depend on the body weight.

Positive impacts of the physical activity are multiplied with additional time and variability in physical activity types. The highest positive impact is achieved in persons who change their activity level from completely inactive to moderately active. Recommended total training time is 150 minutes of moderate or 75 minutes of vigorous physical activity on a weekly basis, and single short blocks of a 10 minutes are encouraged (US DHHS, 2008).

The aim of this study was to estimate the influence of education on the balanced nutrition and physical activity on the body weight reduction. Subjects were males and females of 20 up to 65 ages, from rural and urban area, and study was conducted in „Salus“ private family practice in Tuzla.

## **Subjects and Methods**

Study encompassed data collection, systematisation and classification and at the end analysis of data gathered by anthropometric measurements and data on health status of the patients on the first and final session.

On the first session initiated by the patient, personal information and data on dietary habits and lifestyle were gathered, and anthropometric measurements and medical diagnostics were conducted to determine nourishment and health status of the patient. Education of the patient was delivered through face to face individual interview during which irregularities which patient makes in its diet are indicated and stressed to a patient. At the same occasion principles of the balanced diet aimed at the body weight reduction were highlighted to each patient. As a result

of the session, each patient received an individualised weekly diet plan which should be conducted for the period of the three month. Follow up of the patients was continued after the three month period. On that occasion anthropometric measurements as well as all medical diagnostic conducted at the beginning of the cycle were repeated.

Study design was based on a retroactive insight into the medical records of the “Salus” Tuzla patients.

### Participants

This study encompassed 77 subjects. Study subjects were males (16 subjects) and females (61 subjects), 20 up to 65 years old, partly from rural and partly from urban area. Some of the subjects were, aside from being overweight or obese, healthy, while others had additional health problems (Table 1).

Study encompassed only those subjects (patients) who returned for the control check-up session after the 3 month period of assigned diet and confirmed its adherence. Due to that fact

an assumption was made that nourishment status (overweight, obesity) was purported, among others, by the patient’s lack of knowledge on the observed subject, and that the result after the 3 month treatment period was due to the conducted education and counselling.

Study relied exclusively on the anthropometric data from the medical records for which patients as well as the physician’s approval were gained.

### Anthropometric measurements

Body weight measurement was conducted with an Omron Body Composition monitor BF511 with the precision of  $\pm 0.1$  kg. Measurements were conducted in the morning, before meal, with clothes but without shoes.

Body height measurement was conducted with a clinical altimeter KaWe with the precision of  $\pm 0.1$  cm. During the measurement patients were without shoes, and the measurement itself was conducted with head in Frankfurt position.

Body mass index (BMI) was calculated from the gained data on weight and height.

Table 1. Characteristics of the study participants

Participants	Number of participants	Share (%)
All participants	77	100
<b>GENDER</b>		
Males	16	20.77
Females	61	79.22
<b>LIVING AREA</b>		
Rural	33	42.85
Urban	44	57.14
<b>HEALTH STATUS</b>		
Healthy patients with high body weight	39	50.65
Patients with allergies	10	12.99
Patients with gastrointestinal diseases	11	14.28
Patients with hypertension	9	11.69
Patients with diabetes	8	10.39

### Menu for body weight reduction

With the aim of patient’s education weekly menu was created in line with up to date dietary guide-

lines (food pyramid) and guidelines for management of obesity in adults (Tsigos et al., 2008). Besides guidelines for healthy nutrition created weekly menu respected patients individual pref-

ferences for various types of food. In menu design specially developed software and U.S. Food and Drug Administration (U.S. FDA) food composition tables were used to estimate caloric and nutritive value (FNB, 2005).

Importance of stress avoidance, sleep quantity and quality as well as the physical activity were also stressed to each patient. Furthermore, each patient received recommendations for the appropriate physical activity (Tsigos et al., 2008; Haggis et al., 2013).

Patients were advised to follow prescribed menu for the following three month period.

### *Data analysis*

Gathered data were analysed with respect to patient health status and gender.

Data analysis was conducted with MS Office Excel software (version 2003, Microsoft Corp., USA).

### **Results and Discussion**

Nourishment status, prior and after the three month diet, of those study subjects which were treated only due to the elevated body weight

Average body mass index of study participants treated only due to the elevated body mass prior to education was 32.05 kg/m<sup>2</sup>. After the treatment average body mass index reduction ( $\Delta$ BMI) was 3.26 BMI units and average body mass index value of the whole group was 28.79 kg/m<sup>2</sup> (Table 2). Average intensity of BMI reduction ( $\Delta$ BMI/ $\Delta$ t) was 0.22 units higher in females than in males, what can be explained by higher motivation in females than in males. Influence of motivation is visible from the profile of study participants e.g. the fact that group consisted of only 16 males and 66 females.

Results of the study conducted in British adults confirmed that although most of the obese people

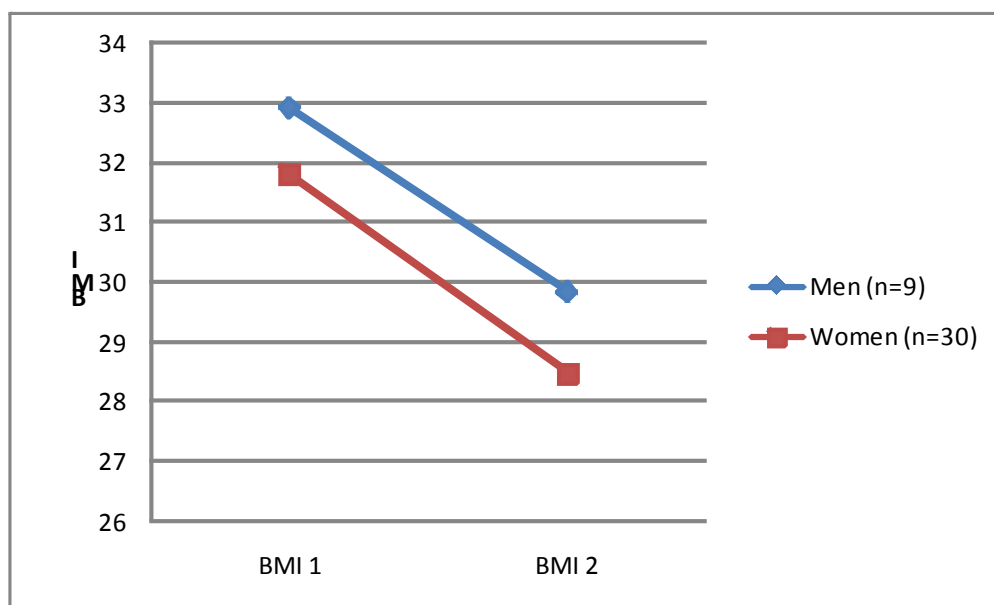
are aware of their excessive body weight, only a small part of them is concerned about it and are trying to lose weight and only a minority had participated in a programme of weight control. Men's awareness was lower than women's (Wardle and Johnson, 2002).

Results presented on the Fig. 1 show that women who were besides elevated body mass of good health tend to react on it and try to manage body weight earlier than men. At the same time, parallel position of the trend lines for both genders indicates that the efficiency of body weight reduction is the same in men and women.

Higher self-criticism towards the self perceived body image in women than in men, as well as the practice of earlier decision to start on a reduction diet, has been confirmed earlier. According to the results of the study conducted in Dutch men and women, 53 % of men and 39 % of women were overweight or obese but 56 % of men and 52 % of women described their weight status as appropriate (Blokstra et al., 1999). 73.5 % of overweight British women correctly perceives them self as overweight, and additional 15.7 % of them perceives them self as very overweight. In total 94.5 % of obese British women are aware of their weight problem but even 50.5 % of them perceives themselves as only overweight instead of very overweight. More than 60 % of obese and overweight women are trying to lose weight, but about 50 % of them for this purpose chooses own diet, and only 5.9 % of overweight and 17.1 % of obese asks advice from the professional. At the same time, just 67.6 % of overweight British men perceives themselves as overweight or obese, although correct self perception in obese subjects is almost as high as in women (92.7 %). 32.2 % of overweight and 56.0 % of obese men is trying to lose weight, and as same as women, they most often choose to achieve that by their own diet while advice from the professional seeks only 3.9 % of overweight and 14.3 % of obese persons (Wardle and Johnson, 2002).

**Table 2.** Body mass indexes before (BMI 1) and after (BMI 2) the education and three month diet period for individual participants and average for the whole group of patients treated only for body mass reduction

Participant	BMI1	BMI2	% change	Participant	BMI1	BMI2	% change
1.	34.00	30.70	9.71	21.	37.00	35.00	5.41
2.	36.21	32.30	10.80	22.	16.00	16.00	0
3.	39.40	32.10	18.53	23.	18.50	19.00	2.70
4.	36.00	30.60	15.00	24.	24.00	24.00	0
5.	47.90	36.00	24.84	25.	27.00	25.00	7.41
6.	34.00	32.80	3.53	26.	27.00	24.00	11.11
7.	34.00	32.70	3.82	27.	28.00	27.60	1.43
8.	37.00	33.00	10.81	28.	29.00	27.00	6.90
9.	34.00	28.00	17.65	29.	29.00	25.60	11.72
10.	35.00	29.00	17.14	30.	30.00	25.00	16.67
11.	35.00	32.00	8.57	31.	30.00	26.10	13.00
12.	35.00	33.50	4.29	32.	30.00	28.00	6.67
13.	37.00	32.00	13.51	33.	31.00	27.00	12.9
14.	27.00	26.00	3.70	34.	33.00	30.50	7.58
15.	28.70	22.50	21.60	35.	33.00	28.30	14.24
16.	30.00	29.00	3.33	36.	34.00	31.20	8.24
17.	30.00	29.00	3.33	37.	34.20	30.30	11.40
18.	31.00	29.00	6.45	38.	36.00	33.00	8.33
19.	31.00	27.00	12.90	39.	39.00	35.00	10.26
20.	32.00	28.00	12.50	Average	32.05	28.79	9.55



**Fig. 1.** Average body mass index before (BMI 1) and after (BMI 2) the education and three month diet period for males and females in the group of patients treated only for body mass reduction



In spite of the general opinion that women perceive excessive body weight earlier than men it should be considered that the ability of self-perception varies among ethnical groups. Due to that fact, public nutritional programs should be ethnic-specific and adjusted for the targeted population by addressing food and health in the context of their culture and taking in account the socioeconomic status of the group (Metcalf et al., 2000).

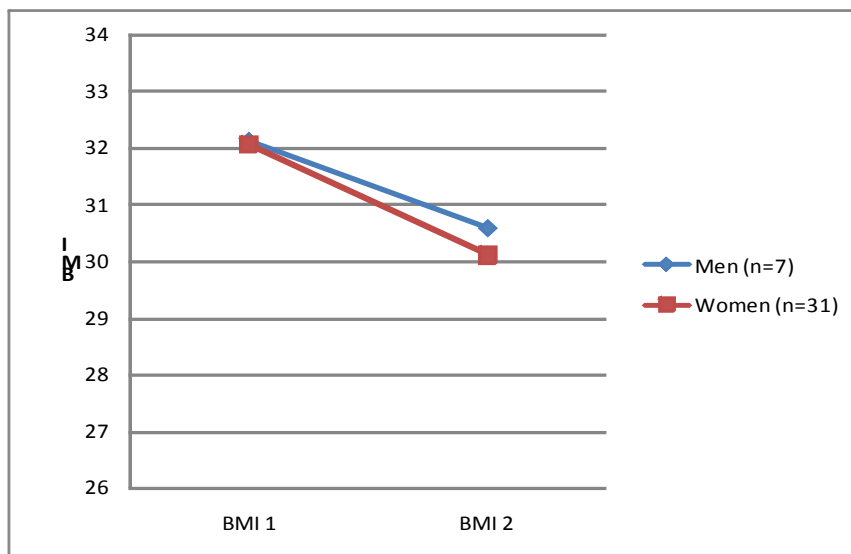
***Nourishment status, prior and after the three month diet, of those study subjects which were treated primarily for their diagnosed health problems***

Besides healthy overweight and obese participants, this study encompassed 8 participants with diabetes, 9 participants with hypertension, 11 participants with gastrointestinal problems and 10 participants with food allergies (Table 1). Average BMI value of the participants who were

motivated to visit the physician primarily due to their diagnosed health problems was at the beginning of the study 32.06 kg/m<sup>2</sup>. By the end of the three month treatment and observation period average BMI of the group decreased 4.60 %, and average BMI value was 30.19 kg/m<sup>2</sup>.

Average BMI of this group matches with the average values of overweight and obese but otherwise healthy participants whose results are mentioned above. In despite to the fact that this group had an additional motive to reduce weight (health status improvement) they had not managed to achieve the same average body weight reduction.

Unlike in the group of overweight and obese but otherwise healthy participants, in the group of participants with diagnosed health problems BMI value at the beginning of the study was same in men and women. Higher interest in women is visible via more intense body weight reduction in women than in men (Fig. 2).



**Fig. 2** Average body mass indexes before (BMI 1) and after (BMI 2) the education and three month diet period for males and females in the group of patients treated only for diagnosed medical problems

From 11 participants in the subgroup of patients who have contacted the physician due to diagnosed gastrointestinal problems 7 have managed to reduce body weight (63.64 % of the subgroup), while 4 remaining participants gained weight during the observed period. Considering the treated health issue, this subgroup encompassed

one participant of the normal body weight status. In this patient dietary guidance resulted with gaining weight but in such intensity to remain in the same body weight status group – normal. Considering the specificity of their health problem, from 10 participants in the subgroup of patients with allergies 6 were overweight or

obese while 4 were of normal weight status. In this subgroup, education on balanced nutrition, as well as the epistemology on the foods which causes their allergy combined with the individualised menu resulted in body weight reduction in 6 participants (60% of the subgroup), while remaining 4 patients gained weight. 2 out of 4 who gained weight remained throughout the study in the normal weight category.

All 8 patients treated primarily for diabetes on the beginning of the observation period were obese according to the BMI ( $\geq 30$  kg/m<sup>2</sup>) (SIGN, 2010). Considering the fact that elevated body weight is the risk factor in diabetics, as expected, body weight reduction was observed in all 8 patients (100% of the subgroup). High intensity of BMI reduction was expected in this subgroup.  $\Delta$ BMI values imply that the reduction is significant in all but one patient. Namely, diabetics undergo various educations in the public health system and therefore are aware that body weight reduction and after that body weight control is one of the most important elements of diabetes treatment. Results of the studies conducted in diabetics have confirmed that education on balanced nutrition plays an important role in disease control but the motivation for healthy behaviour must be patient driven. Furthermore, it is important that patients awareness, motivation and decision making comes first, and information and skills being considered as essential components to be “available on demand” rather than to be “imposed” (Maldonato et al., 2010). Education

participants of this study in family practice Salus encompassed patients education on balanced nutrition but at the same time provided practical and individualised guide (weekly menu) which patients could follow during the study period. This probably contributed to such high success in body weight reduction of the study participants. As same as the diabetics, all participants from the subgroup of the patients with diagnosed hypertension were obese (BMI  $\geq 30$  kg/m<sup>2</sup>) (SIGN, 2010). Also, as same as the diabetics, all patients in this subgroup (100% of the subgroup) have managed to reduce weight during the observation period and  $\Delta$ BMI was the highest from all observed subgroups and varied from -1.20 up to -6.00.

Effectiveness of education on the body weight reduction among healthy in comparison to those among persons with diagnosed health problems Average BMI reduction was smaller in the group of patients with diagnosed health problem than in the group of overweight or obese but otherwise healthy patients. To avoid misleading judgements, great differences among subgroups based on the health issues should be considered. Namely, in spite of the fact that relatively high share of patients in the subgroups with gastrointestinal problems and allergies reduced weight the intensity of reduction was not so strong, and additionally in some cases weight gain was perceived (Figures 3 and 4).

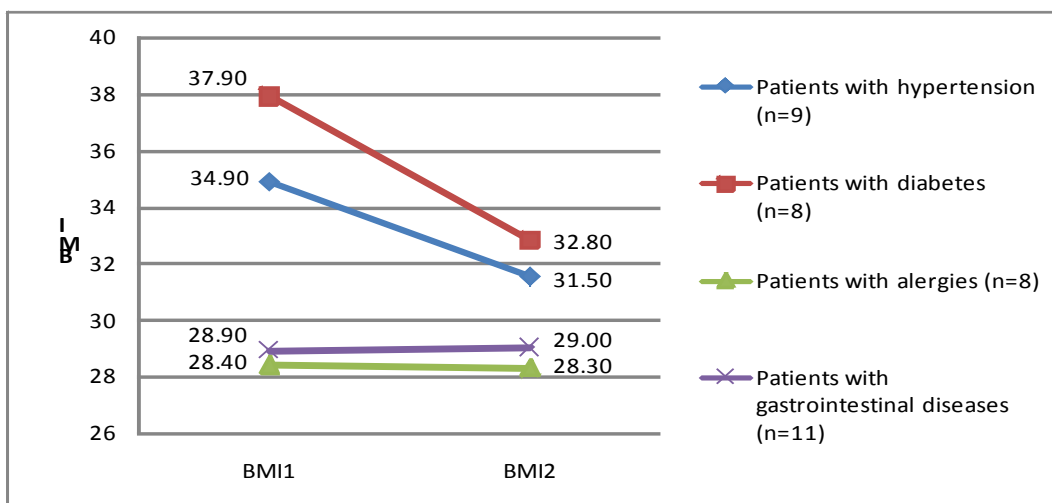


Fig. 3 Body mass indexes before (BMI 1) and after the education and three month diet period (BMI 2) for

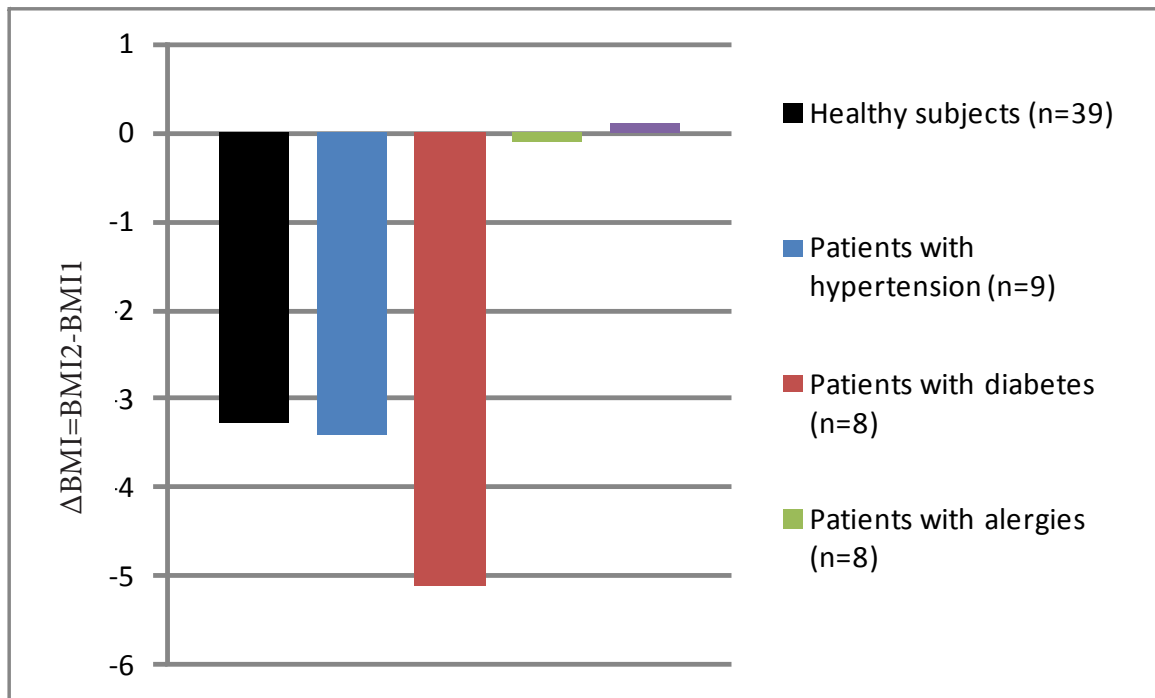


Fig. 4 Average intensity of change in body mass index ( $\Delta$ BMI) for subgroups based on health status of participants

In the subgroups of patients with diabetes and hypertension BMI reduction intensity was stronger (Figures 3 and 4) which can be explained by the awareness of the patients on the role of excessive body weight in the disease development. Also, fear of consequences of their primary disease elevates the motivation for weight reduction.

Positive impact of the therapeutic patient education in chronic diseases (diabetes, hypertension) and obesity was previously reported and varies from 50 – 80 % (Laggar et al., 2010).

In data analysis and concluding process it should be considered that the observation period of three months is rather short and that for realistic conclusions relating success rate patients follow up should be conducted during the future period. Namely, even results of the study conducted in diabetic population which is highly motivated for positive change in dietary habits to achieve necessary blood glucose control show that benefit declines 1 – 3 months after the intervention ceases (Norris et al., 2002). In populations in which dietary influence is not so direct and measureable and as a result patient does not respect it as

important, decline in learned behaviours would be even faster without continuous professional guidance and motivation.

Considering the nourishment status throughout the study (at the beginning and at the end of the observation period) it is noted that in spite of the body weight reduction patients with gastrointestinal problems and diabetics remained in the same nourishment status category based on the BMI as a criteria (SIGN, 2010) while in other studied subgroups such positive change occurred. The most intensive change with respect to BMI nourishment status categorisation was noted in overweight and obese but otherwise healthy patients.

Although the official criteria of the nourishment status are good orientation point for the professionals dealing with patients in weight management programs, and could also be a motivation source for the patient itself in cases in which starting values are close to the lower boundary value, in our study in which starting values were closer to the upper boundary value they were less important than the weight reduction itself.

An analysis of the evidence from 300+ studies



shows that nutrition education is more likely to be effective when it focuses on behaviour/action (rather than knowledge only) and systematically links theory, research and practice (Contento, 2008).

## Conclusions

Results of this study have confirmed the starting hypothesis. The results have confirmed that education leads to weight reduction in more than 50 % of all subjects, and with the success rate of 100 % in some of the specific subgroups in which motivation is high (patients with diabetes and hypertension).

To achieve long term positive effect, sessions should be continued with the patients for the future period of at least one year during which implemented diet could become dietary habit of a person for the rest of the life. Patient's motivation should additionally be supported through the creation of at least one diet plan for each season.

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