DOCTORAL (PHD) DISSERTATION

THESES

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THE ROLE OF THE ENVIRONMENT IN THE DEVELOPMENT, TREATMENT AND PREVENTION OF OBESITY

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1. SCIENTIFIC BACKGROUND, OBJECTIVE

Genetic and environmental factors play a role in the development of obesity. Over the past decade, the importance of obesity, an obesity-prone environment, has come to the fore. Treatment of obesity can not be considered solved. The well-known but individualized analysis of the two key factors of lifestyle, the decisive role of nutrition and physical activity, and the lifestyle modification recommendation, are not yet universal. The role of environment in the treatment and prevention of obesity is emphasized. Our dietary habits are characterized by an abnormal amount of nutrient uptake and composition, and our lifestyle changes include fasting meals and hypercaloric nutrition. The health-harmful composition of nutrient consumption is well-known on the basis of various population surveys (OTÁP 2009, 2014). The energy consumption in excess of the energy requirement and the composition of nutrient uptake are both pathogenic factors. However, in addition to the two traditional main factors, over nutrition and physical inactivity, novel and newer factors are also a factor in the literature, such as stress, sleep deprivation, infections, intestinal bacteria, toxic substances, hormone modifying compounds. At the same time, the use of convenience products and equipment, the effects of advertising and the consumer society, education, income, health culture or low iodine intake, side effects of certain drugs, intrauterine effects, maternal age, impaired immune functions, but also the environmental temperature or the built environment.

Lifestyle interventions

1) The effect of a weight-loss complex nutrition and exercise program on body weight and cardiovascular risk factors

The four pillars of our program are: water gymnastics, gymnastics, walking programs and hypocaloric diets. Body mass, body fat mass, body fat percentage, visceral fat area In Body720 multifrequency five-cylinder bioimpedance measuring instrument. Cardiovascular risk factors were determined by routine clinical chemistry laboratory tests. The results were evaluated by mathematical statistical methods. Number of subjects: 146 average age: 44.9 years (SD: 10.64) min.- max. 17-72 years, BMI average: 41.59 kg / m² (SD: 8.28). The average duration was 22.66 (SD: 12.55) days. During the period under review, the average number of individual steps was 238,139.7 (SD: 247,939.8), the average distance was 125.93 km (SD: 104.7), the amount of energy released was 10.693,8 kcal (SD: 9231.4) . The initial and post-treatment results are summarized in Table 1. The difference between the initial and finite values of all parameters is significant ($p<0.001$).

Table 1. Evolution of anthropometric parameters and risk factors before and after treatment

	before treatment		after treatment	
	mean	SD	mean	SD
Weight (kg)	121.7	27.3	115.8	26.9
BMI (kg/m²)	41.5	8.2	39.3	7.8
waist circumference (cm)	123.5	18.1	117.6	17.5
hip circumference (cm)	128.7	17.2	124.6	16.5
body fat%	42.0	8.1	41.1	8.5
body fat (kg)	52.6	18.2	48.3	17.7
VFA (cm²)	179.6	57.8	168.3	50.6
RR Systolic (mmHg)	149.6	19.5	125.0	12.3
RR Diastolic (mmHg)	91.7	12.6	77.8	7.6
blood sugar (mmol / l)	6.2	2.2	4.9	1.1
cholesterol (mmol / l)	5.2	1.1	4.5	1.0
LDL-chol (mmol / l)	3.1	0.9	2.7	0.8
HDL-chol (mmol / l)	1.3	0.3	1.6	0.2
triglyceride (mmol / l)	2.3	1.6	1.6	0.7
hCRP (mmol / l)	8.8	8.7	5.3	4.8
distance km/day	4.4	2.9	10.1	5.4
number of steps/day	7612.5	5129.8	18302.6	8980.8

2) Effect of increased amino acid content low calory diet on body composition and blood pressure

The use of meal substitution shakes or pre-prepared special foods for obesity therapy has been reported recently by some countries in treatment protocols. At present, the use of nutrition substitutes for increased amino acid gains has been a factor in treating obesity. The study of food substitution was possible in 22 cases, for comparison, the control group was trained by 11 obese persons. The average age of treated patients (n:22) was 42.82 years, the mean of 24-64 years. The body weight index is 40.98 kg/m² (SD: 9.85). In the control group, 11 obese people, previously without a meal substitute, were treated by other patients who had the same lifestyle therapy as the group recieving the treatment supplement. The mean age of the control group was 41.72 years, ranging from 22 to 68 years, with an average BMI of 41.63 kg/m² (SD: 7.54). Separation of patient data by gender was not necessary because of similar values and number of elements.

After a detailed recording of the medical history anthropometric measurements, dietetic consultation and advice, and detailed analysis of body composition during physical examination and at each visit measuring bioimpedance, which in all cases was InBody720 multifrequency eight electrode five cylinder (torso and four limbs) device which intra-abdominal also made it possible to determine the fat area. In the treated group an average of 8.77 visits (SD: 4.89) was possible with a predetermined interval of two weeks for an average of 21.23 weeks (SD: 14.15), with a mean number of visits of 8.2 in the control group, but the duration of treatment was significantly longer , reached 39.9 weeks (SD: 26.42). The average duration of the visits resulted from about 45-60 minutes in both groups due to psychic driving for proper co-operation . In the body weight test, the average body weight of patients receiving treatment with a meal replacement decreased from 122.54 kg (SD: 31.56) to 108.53 kg (SD: 29.67) at the end of treatment. The percentage reduction was 11.10% (SD: 8.58). The body mass index (BMI) decreased from 40.98 (SD: 9.85) kg/m^2 to 36.29 (SD: 8.74) kg/m^2. The body fat mass was reduced from 55.74 kg (SD: 22.09) to 44.22 kg (SD: 20.07). The change was 11.52 kg (SD: 11.02). This represents a decrease of 20.43% (SD: 13.93).

The reduction in body fat of 22 cases is shown in Figure 1. The body fat percentage decreased from 44.41% (SD: 8.56) to 39.54% (SD: 8.78). The intraabdominal fat area decreased from 195.26 cm^2 (SD: 68.62) to 167.39 cm^2 (SD: 58.53). The percentage reduction was 12.60% (SD: 17.15 median: 13.38). The waist circumference was 121.79 cm (SD: 20.76) to 110.84 cm (SD: 19.57), the hip circumference was 132.5 cm (SD: 20.44) to 123.18 cm (SD: 19.09) decreased. The change was always significant ($p<0.001$). Skeletal muscle decreased slightly from 37.46 kg (SD: 8.44) to 35.98 kg (SD: 8.26 $p=0.002$). The change corresponded to 1.48 kg (SD: 2.07), a percentage decrease of 3.83% (SD: 5.09). Systolic blood pressure decreased from 148.57 mmHg (SD: 22.41) to 127.28 mmHg (SD: 11.89 $p<0.001$), normalized. Diastolic blood pressure ranged from 93.04 mmHg (SD: 14.22) to 82.28 mmHg (SD: 7.9 $p=0.001$), so the diastolic blood pressure also normalized. The heart rate at baseline of 82.76/min (SD: 14.48) was practically unchanged at the end of treatment by 79.42 (SD: 10.16 NS), meaning no increased sympathetic nervous system metabolism. Systolic decreases in blood pressure have a strong correlation with body fat, abdominal and hip circles, and the decline in visceral fat, with the latter being correlated with diastolic blood pressure.

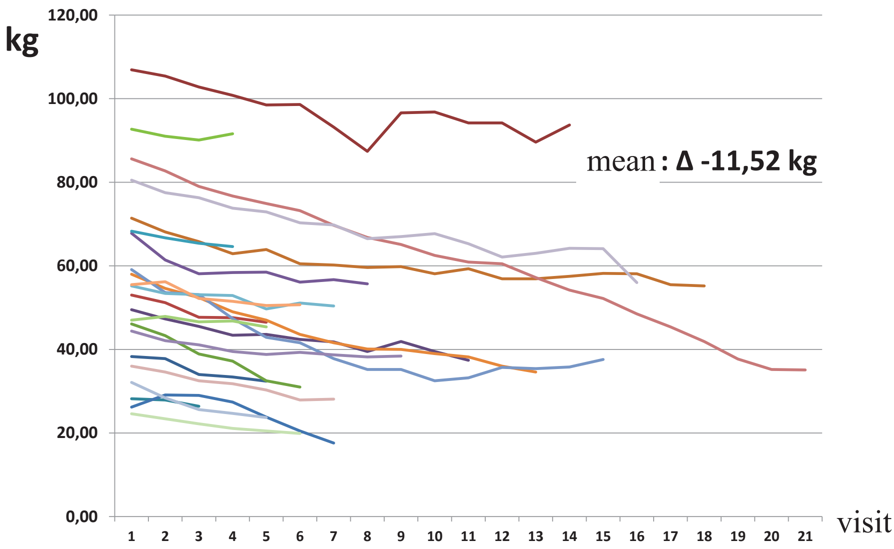

Figure 1 Decrease in body fat during visits

3) The effectiveness of a community based lifestyle program

Given that the long-term efficacy of weight loss programs is very low, long-term weight maintenance should be sought. Early studies have highlighted the importance of well-led self-help community activity in order to stabilize weight control in practice. We developed a community model of a multi-year life-style program based on education aimed at changing the way of life, providing a proper nutritional environment and a combination of physical exercise. We used it for five years, regularly once a week. The sessions lasted three hours a week. On each day of treatment, body weight, body height, waist and hip circumference and body fat percentage for single-phase Tanita bioimpedance measuring instrument were determined for good co-operation and motivation. During the first two years, a total of 178 Budapest women were involved in the implementation of the weight-bearing program. After acquiring theoretical and practical knowledge, participants dropped out after a period of different duration, so 49 people were not taken into account in the evaluation. In the first two years of the five-year operating period of group sessions we summarized the results using a mathematical statistical method.

Based on the first and last treatment day of the evaluable 129 participants, we compared the values of the two days. During the two-year treatment the body weight of the subjects did not increase even in physiological terms, but decreased by 1.5 kg (2%) (mean: 79.5 SD: 19.1 vs. mean: 77.7 SD: 17.3

decreased p<0.001), body mass index of 0.7 kg/m² value (mean 30.2 SD: 6.7 vs. average: 29.4 SD 6.0 p<0.001). The abdominal circumference decreased by 2.1 cm (mean 90.9 SD: 15.7 vs. mean 88.8 SD 14.3 p<0.001). The hip circumference decreased by 1.1 cm (mean 113.0 SD: 13.6 vs. average: 111.9 SD 12.8 p<0.05). The abdominal / hip ratio decreased by 0.01 (mean: 0.80 SD: 0.07 vs. mean: 0.79 SD: 0.07 p<0.05). The calculated changes, though with a mathematical statistical method, show significant differences, can not be biologically considered significant due to a slight change of values. Positive evaluation of the correlation between body weight loss and decreased weight loss (r=0.839 p<0.001), weight loss and reduction of the hip circumference (r=0.727 p<0.001), and weight loss and waist circumference reduction (r=0.559 p<0.01) and ultimately the correlation between waist circumference decrease and decrease in hip circumference (r=0.471 p<0.01). In the complex weight-term program in groups of participants performed 77% - of body weight has not changed in accordance with the objectives the two-year period. 5% or more weight gain occurred in 2%. Some participants were targeting weight loss, so 6% of participants found body weight more than 10% weight loss. 15% of the participants - the value was between 5-15% weight loss (Figure 2).

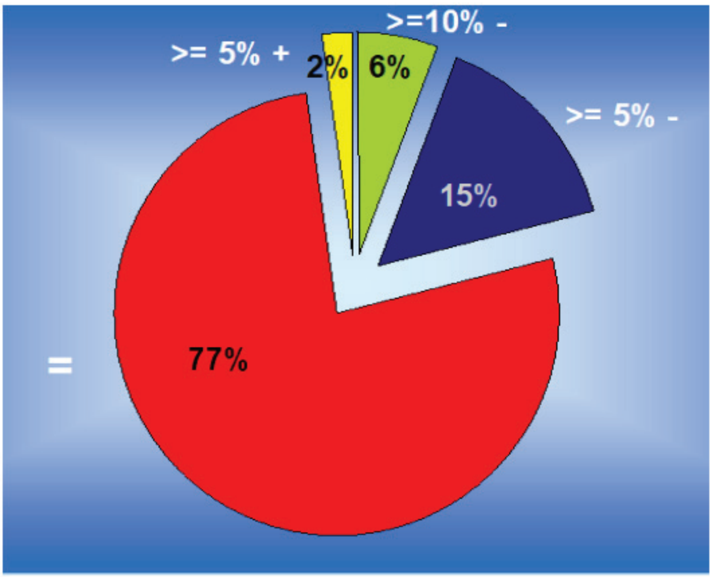

Figure 2 Distribution of body weight change

The average 2% reduction in the body weight of the participants did not reach the general goals of dieting, but this was not the goal of the study. Biologically, however, the results appear to be significant as no physiological gain has been established and the strong correlation between body weight loss and fat loss appears to be a substantive change. We consider the strong correlation between body weight loss and hip reduction ($r=0.727$ $p<0.001$), which can be explained by regular exercising on the hip and lower limbs. Weight loss also coincided with decreased abdominal volume ($r=0.559$ $p<0.01$), indicating a decrease in intraabdominal fat. Systolic blood pressure was 1.4 mmHg and diastolic decreased by 3 mmHg. The latter significantly (t [45] = 2,420, $p<0.05$). Hypertension decreased from 45.7% to 32.6%.

Possibilities of lifestyle therapy in general practitioners' practice

Obesity-prone genetic predisposition, in addition to obesity, also has a beneficial weight loss effect. Although obesity is associated with a number of triggering environmental factors, treatment is basically life-style therapy, in which the two main factors that can be modified, a balanced diet and a combination of increased physical activity, can provide long-term results that can be accompanied by behavioral therapy if necessary. In the therapeutic palette, when necessary, treatment of obesity is treated as a medication therapy, where appropriate balloon therapy, and various metabolic and bariatric surgical solutions. The use of lifestyle therapies based on body weight programs is recommended at international level at basic level.

The GPs would be in a privileged position to obesity, but they were not interested in starting any obesity lifestyle therapy at any time. We conducted a study to analyze the question among about 10% of GPs, using 521 practicing GPs or resident practices using a questionnaire survey. Only 51% of the questioned GPs and residents were informed about the diagnostic options for obesity (60% in cities) and the highest rate was 90% among residents. Significant differences were found between the age of doctors, gender, BMI, the location and pre-qualification of the operating district (77% knowledge of 68%). The most frequently measured parameter was the waist circumference (72%) and the waist/hip circumference (62%). The bulk of the body weight was registered among the doctors in Budapest and gave a higher proportion of nutrition advice. Diagnosis in BMI was also higher in cities than in 85%. Female doctors for a longer period (65% vs 44%) and more often advised their patients (65% vs. 52%). Our study draws attention to the fact that general obesity training and easy-to-read vocational guidance in general practitioners / primary care providers are needed to provide obesity in public health.

In the practice of general practitioners, diabetes mellitus and hypertension in the elderly population are a major challenge. Multimorbid conditions such as metabolic syndrome, overweight, and obesity occur more frequently and we have more and more evidence that abdominal obesity alone increases the risk of cardiovascular disease. 540 adults (between 60 and 75 years of age) were retrospectively screened in the GPs by self-assessment questionnaire method (225 men and 315 women) up to the age of twenty years by measuring the body weight per decade. We compared diabetic or hypertensive patients with non-comorbidities. The current body weight was always significantly higher than the body weight of 20 years. Hypertensive men and women were fattened in the 4th and 5th decade of their lives. People with diabetes mellitus had a higher body weight gain during their lifetime. Among men, 20 to 30 years of age, in women 30 to 40 years of age was the highest increase in body weight and also observed increase in both sexes between 50 and 60 years before diagnosis of complications. We came to the conclusion that between 20-40 years of age the prevention of weight gain may be of particular importance in the prevention of diabetes mellitus. Weight maintenance and minimum body weight increase over the years can prove to be a preventive factor, which will be required to carry out more epidemiological studies.

My thesis questionnaires for my dissertation:

1) What are the role of two main lifestyle factors and, what other environmental factors play a role in the development of obesity, in addition to the nutrition and low physical activity? Evaluation and systematization of proven and supposed factors
2) What characterizes obesity in adulthood and how is the quantity and composition of food intake from controls of normal body weight different in overweight and obesity?
3) How can my research results be utilized in the health care of obesity and the individual and social levels of treatment and prevention?

2. MATERIAL AND METHOD

Literature research

Based on literature research I hypothesize that besides the two main factors, additional significant environmental factors can also play a role in the development of obesity, evaluate and summarize literature results.

3x24 hour nutrition interview method

Further to 3x24-hour dietary interview, based on the completed data sheets quantitative estimates of consumed food and beverages in determining food intake and the data was the NutriComp 3.0 computer program and recorded individually evaluated line. After calculating the basal metabolism (BMR) with the MIFFLIN-ST JEOR formula, the declared energy value was compared to the BMR, thus excluding under reporting (<1.1) and excessive (>2.7) cases. The results were analyzed by routine statistical methods (ANOVA, t-test). I evaluated the data for age standardization by gender and BMI (Body Mass Index). I have also looked at some nutrient components for bodyweight and 1000 kcal. For the dietetic survey, I prepared a brochure with pictures to prepare a dietary interview report.

To assess the nutrition intake of obese (30-39.9 kg/m²) and morbid obese (≥40 kg/m²), overweight (25-29.9 kg/m) and normal weight (18.5-24.9 kg/m) control groups. Basic data of the examined persons: Number of cases requested: 714. Number of interviews completed: 462, out of which overweight / obese 401 (438 from request), normal weight: 61 (276 from request). The number of fewer reported: obese: 155, out of which 43 men (31.2%), 112 women (42.6%), normal weight: 7, of which 1 (6.25%), 6 women (16.2%). The number of revelations is obese: 2, of which 2 men (1.4%), women were not, normal weight: 1, no male, 1 woman (2.7%). 38% of the cases were excluded due to over or undervalued quantities. All cases in statistical processing (n=287) mean age (SD): 50.7 (11.8) years, BMI average (SD): 37.1 (8.9) kg/m². According to BMI we have formed four groups. The number of cases of overweight (BMI 25-29.9 kg/m²), obesity (30-39.9 kg/m²) and morbid obesity (≥40 kg/m²) is 234, of which 88 males, 146 women, weight (BMI>25 kg/m²) controls: 53, of which 16 men, 37 women.

Statistical Methods

Descriptive statistical methods: relative and absolute frequencies, mean, standard deviation (SD). When comparing the interrelated samples, 1-sample t-test was used, and a 2-sample t-test was used to compare independent groups. Several independent groups were compared by ANOVA, the pairwise comparison was performed using Tukey. Pearson's correlation was used to analyze the correlation of continuous statistical variables. Significance levels were assessed by two-sided probes at p=0.05.

3. RESULTS

In my grouping of the factors involved in obesity development (Figure 3):

1) lifestyle factors
    - ✓ nutrition (quantity, quality, liquid consumption)
    - ✓ physical inactivity
    - ✓ distress
    - ✓ lack of sleep
    - ✓ smoking (leaving)
    - ✓ alcohol consumption
    - ✓ medicine, other substance use
2) genetic reasons
    - ✓ monogenic
    - ✓ polygenic
    - ✓ epigenetic
    - ✓ trans-generic
3) maternal causes
    - ✓ intrauterine effects
    - ✓ reproductive fitness
    - ✓ maternal age
    - ✓ maternal nutrition
    - ✓ maternal smoking
    - ✓ neonatal nutrition
4) inflammatory causes
    - ✓ viruses
    - ✓ intestinal bacteria
    - ✓ impaired immune function
5) natural and built environmental factors
    - ✓ endocrine disruptors
    - ✓ soil, water, air pollutants
    - ✓ low iodine uptake
    - ✓ geographic conditions
        - o highlands, reliefs
        - o climate, temperature
    - ✓ built environment
        - o human settlements planning
        - o building design

6) social / mental environmental factors

- ✓ psycho-social effects, connection system
- ✓ economic situation, income relations
- ✓ socio-cultural environment, religion
- ✓ education, knowledge
- ✓ demographic conditions
  - age
  - gender
  - ethnicity
  - social status
- ✓ demographic change (aging society)
- ✓ policy impact

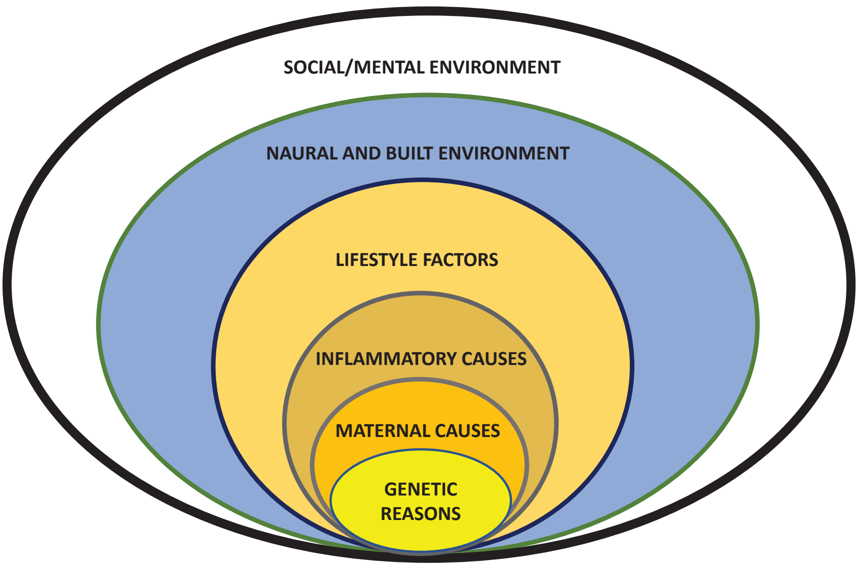

Figure 3 The systematization of obezogenic factors in the development of obesity

Energy and nutrient uptake of obese, overweight and normal body weight by sex and body mass index groups

Table 2 Basic data of men, calculated BMI, BMR, energy intake

Men	BMI groups							
	< 25 n = 16		25-29 n = 23		30-39 n = 33		40 < n = 32	
	mean	SD	**mean**	SD	**mean**	SD	**mean**	SD
BMI (kg/m²)	22.8	1.4	27.3	1.8	34.5	3.4	46.4	6.7
Age (years)	43.7	15.5	54.5	14.1	47.8	10.8	44.3	10.0
Weight (kg)	71.8	7.7	84.8	10.5	107.9	16.2	147.2	20.2
Height (cm)	177.3	7.7	176.0	8.2	176.4	7.5	178.2	6.4
Basal metabolic rate (BMR)	1 613	151	1 681	168	1 948	209	2 370	230
Energy intake (kcal/day)	2 662	440	2 493	579	3 111	803	3 567	752
Energy intake / BMR	1.65	0.22	1.48	0.31	1.60	0.37	1.51	0.31

Table 3 Basic women's data, calculated BMI, BMR, energy intake

Women	BMI groups							
	< 25 n = 37		25-29 n = 38		30-39 n = 71		40 < n = 37	
	mean	SD	**mean**	SD	**mean**	SD	**mean**	SD
BMI (kg/m²)	21.4	2.1	28.1	1.1	34.6	3.1	48.4	6.1
Age (years)	35.6	12.0	47.4	11.7	46.6	11.8	43.6	11.4
Weight (kg)	59.1	6.0	76.1	6.6	93.2	11.9	130.3	19.2
Height (cm)	166.3	6.1	164.4	6.8	163.8	6.6	163.9	6.8
Basal metabolic rate (BMR)	1 291	109	1 390	141	1 562	174	1 948	232
Energy intake (kcal/day)	2 051	427	2 229	447	2 331	567	2 786	637
Energy intake / BMR	1.60	0.36	1.61	0.34	1.49	0.33	1.43	0.28

The total energy intake per day increases significantly in both sexes by increasing BMI (ANOVA: $p<0.001$), meaning that overweight and obese groups are more energy-absorbed than in the normal weight group.

The total daily energy per kilogram of body weight decreases with an increase in body mass index (Figure 4).

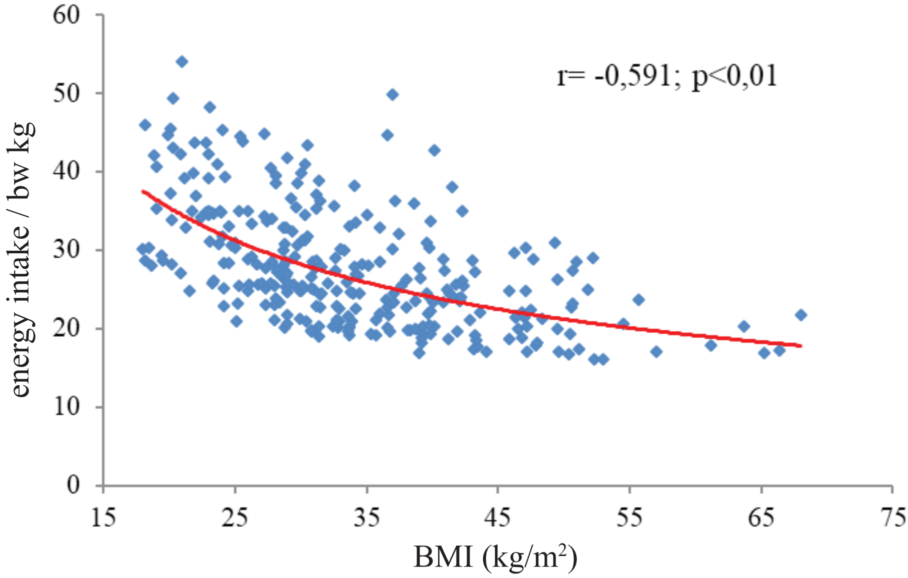

Figure 4 Energy intake per kg body weight according to BMI groups

Table 4 Men intake of macronutrients and dietary fiber (g/day), fiber 1000 kcal/day

Men	BMI								ANOVA
	< 25 n=16		25-29 n=23		30-39 n=33		40 < n=32		sign.
Nutrition g/day	**mean**	SD	**mean**	SD	**mean**	SD	**mean**	SD	
Protein	100,0	20,9	93,2	24,3	121,6	35,2	136,0	33,1	p<0,001
Carbohydrate	308,9	79,1	268,8	60,1	325,1	111,1	369,8	100,3	p<0,01
Fat	107,5	27,9	104,1	32,4	135,4	48,4	159,4	43,5	p<0,001
Dietary fiber	26,3	9,3	24,3	5,0	28,7	11,0	29,6	10,4	NS
Dietary fiber/g/ day/1000 kcal	9,9	2,9	10,2	2,9	9,2	2,3	8,5	2,9	NS

Table 5 Women intake of macronutrients and dietary fiber (g/day), fiber 1000kcal/day

Women	BMI								ANOVA
	< 25 n=37		25-29 n=38		30-39 n=71		40 < n=37		sign.
Nutrition g/day	**mean**	SD	**mean**	SD	**mean**	SD	**mean**	SD	
Protein	75,8	17,4	84,3	17,2	90,8	23,3	109,1	27,8	p<0,001
Carbohydrate	246,3	65,1	259,6	63,5	260,9	73,3	314,4	93,6	p<0,001
Fat	79,2	20,1	90,1	21,1	98,8	29,0	155,4	227,0	p<0,01
Dietary fiber	21,3	7,0	25,3	10,3	22,7	8,7	26,1	6,9	p<0,05
Dietary fiber/g/ day/1000 kcal	10,4	2,6	11,3	3,5	9,8	2,8	9,5	2,1	p<0,05

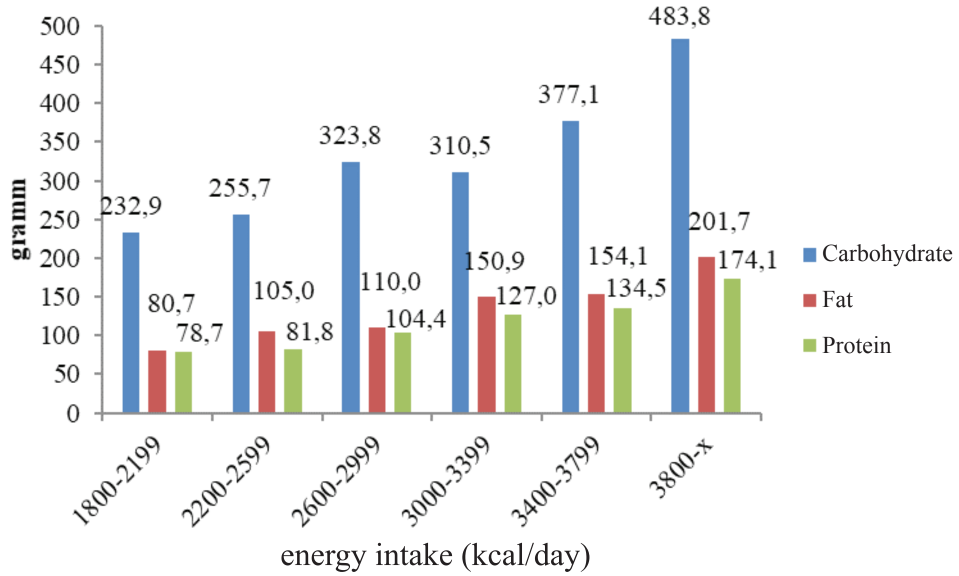

Figure 5 Intake of macronutrients in men (g)

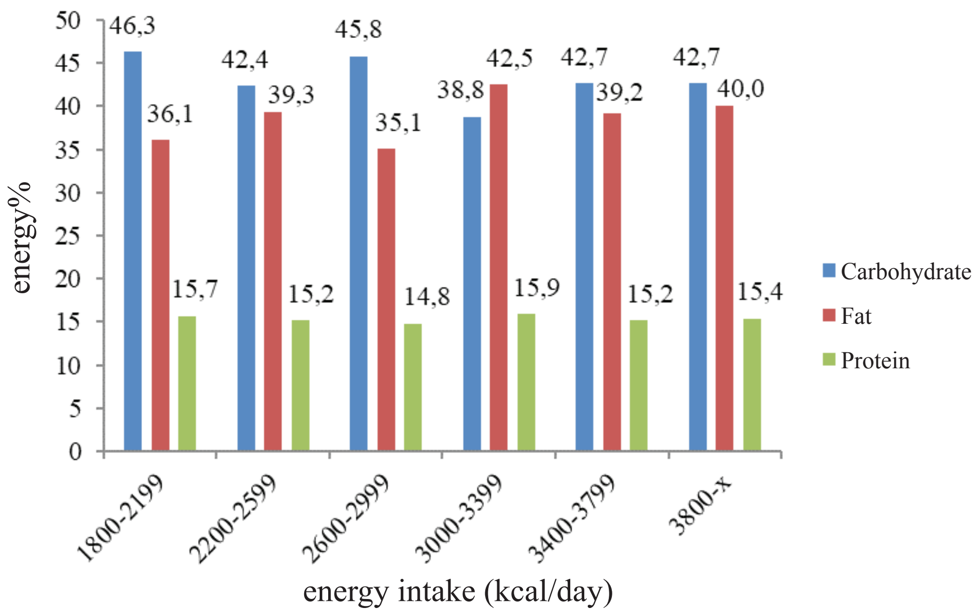

Figure 6 Intake of macronutrients in men (en%) by energy intake

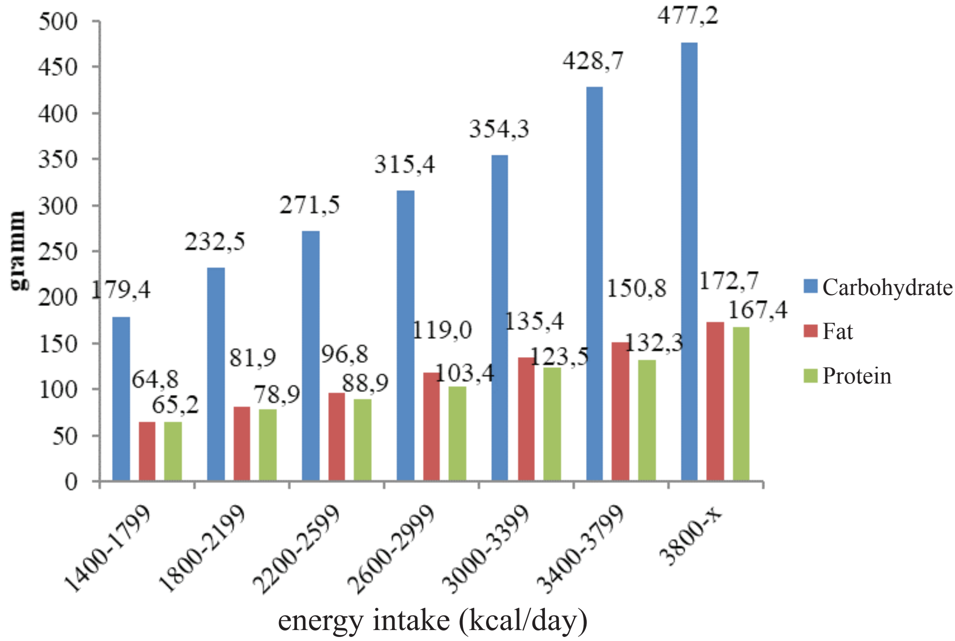

Figure 7 Intake of macronutrients in women (g)

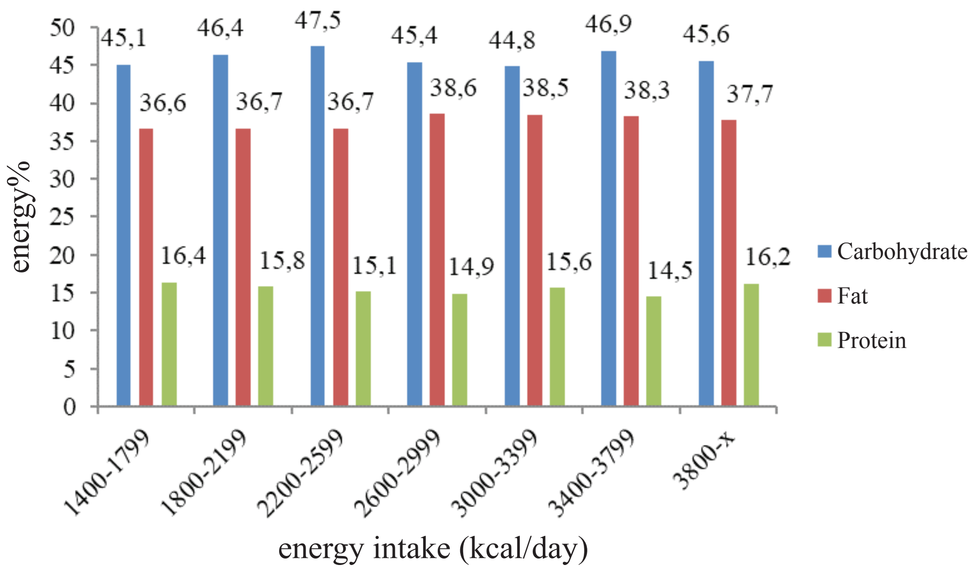

Figure 8 Intake of macronutrients in women (en%) by energy intake

Macronutrients uptake (g) increases in increasing groups of daily energy in men and women (Figure 5, Figure 7). The distribution of the energy share in both sexes in all BMI groups, NS and also in energy intake groups (Figure 6, Figure 8). Thus, it can be concluded that the percentage of energy overtake of obese and obese did not result in extreme differences in fat uptake or carbohydrate uptake.

Carbohydrate and dietary fiber uptake by body mass index and gender

Total carbohydrate intake: mean (SD) for men by BMI groups: normal weight 308.9 (79.1) g; overweight is 268.8 (60.1) g; obese 325 (111.1) g; morbid obese had a linear increase of 369.8 (100.3) g ($p<0.01$). Significant difference is only between the normal weight and the morbid obese group ($p<0.05$). Female carbohydrate uptake by BMI groups: 246.3 (65.1) g; 259.6 (63.5) g; 260.9 (73.3) g; 314.4 (93.6) g increases linearly ($p<0.001$). Significant difference is only between the normal weight and the obese morbid group ($p<0.001$). Except for the overweight group, the intake of carbohydrate in men was significantly higher in both normal ($p<0.01$) and obese ($p<0.01$) and morbid obese ($p<0.05$) in men. Men intake by increasing BMI groups are proportionally increased in total carbohydrates, but carbohydrates tend to be decreasing in energy. The ratio of total carbohydrate energy consumption to the obese group was significantly decreased ($p<0.05$). Contrary to this, the fat energy percentage was not significant, but increased in trend with unchanged protein uptake. The simple carbohydrate uptake in grams and in terms of energy does not show any significant change in BMI growth, except for the significant increase in added sugar in morbid obesity. Men mean (SD): 26.3 (9.3) g; 24.3 (5.0) g; 28.7 (11.0) g; 29.6 (10.4) g and women mean (SD): 21.3 (7.0) g; 25.3 (10.3) g; 22.7 (8.7) g; 26.1 (6.9) g of fiber was measured by BMI. The fiber uptake was not the same as for 1000 kcal. Compared to normal weight controls, only women with overweight ($p<0.05$) and morbid obese ($p<0.05$) showed significant differences.

Fat uptake by body mass index and gender

Total fat intake of men increases in grams by body mass index (BMI) (ANOVA $p<0.001$). In comparison to parity, obesity gains are higher ($p<0.05$), morbid obesity (mean (SD): 159.4 (43.5) g) at higher significance level ($p<0.001$) than normal weight control. Women's fat intake by BMI increase ($p<0.01$). Fat intake only in the morbid obese group mean (SD): 155.4 (27.0) g higher ($p<0.01$) than normal weight. In all groups, except for the morbid obese group, the total fat in men is higher in women than in the normal and obese group, $p<0.001$, in the overweight group $p<0.05$. In both sexes, the uptake of saturated fatty acid (SFA) increases by BMI ($p<0.001$). In men, only the morbid obesity group was higher ($p<0.001$), in women, both obese (p<0.01) and morbid (p<0.001). In men, the uptake of vegetable fat is NS, in women only in the morbid obese group (p<0.05). Men in one place have monounsaturated fatty acid (MUFA) increased by BMI (p<0.001), women in NS. In both sexes, the inclusion of polyunsaturated fatty acids (PUFAs) in several places by BMI (p<0.001) increases. The PUFA of the obese group of morbid obese was significantly higher in the morbid obese group, with all PUFAs (p<0.001), linoleic acid (p<0.001), arachidonic acid (p<0.05) and n-6 fatty acids (p<0.001), the overweight group did not show any deviation. All PUFAs, linoleic acid, arachidonic acid, n-6 fatty acid values in obese women are higher than in the normal weight group, n-3 fatty acids, EPA, DHA, n6/n3 ratio did not change. The morbid obese group of women had a higher intake of PUFA, linoleic acid, linolenic acid, arachidonic acid and n-6 fatty acids (p<0.001). The PUFA/SFA ratio does not change according to BMI for both men and women, according to gender there is no difference.

Protein uptake by body mass index and gender

The intake of men and women in the energy percent by body mass index groups did not change (ANOVA NS). There was no perceptible difference in the pair's comparative analysis of BMI groups. The inclusion of essential amino acids in men in a group study in all essential amino acids increased in the obese and morbid obese group (p<0.001). Recruitment of the essential amino acid level of women significantly (p<0.001) increased linearly. The increase in all groups is significant compared to the normal weight control group (p<0.001). The intake of proteins of animal origin by the body mass index showed a significant increase in the body mass index (ANOVA p<0.001), a pair of animal-derived protein recruitments per body weight index group of obese (p<0.05) and morbid obese (p<0.001) increased relative to the control group. The increase in the number of animals of animal protein by body weight index (ANOVA p<0.001) showed a significant increase in bodyweight index (p<0.05) and morbid obese (p<0.001) increased relative to the control group.

In all cases, the intake of proteins of animal origin, except for the overweight group, was significantly greater than that of women. The increase in plant protein in men by group weight was significantly increased (p<0.01), compared with the control group in the pair study the morbid obesity group showed a significant increase (p<0.05). For women it only showed an increase in tendency (p=0.081). In the pairwise comparative study, morbid obese patients increased significantly (p<0.05) compared to the normal weight control. Protein uptake in men was greater than normal (p<0.01) and morbid obese patients (p<0.05).

Based on the results of the protein uptake, that a large increase in amino acids was observed by BMI group, in other respects, the proteins did not show a typical difference in obesity.

Vitamin uptake by gender and body mass index groups

Table 6 Recording of vitamin intake below the recommandation by sex

vitamin	A	D	E	B1	B2	B3	B4	B5	B6	B7	B12	C
men (%)	84,8	100	36,4	39,4	24,7	15,2	100	69,7	6,1	27,3	18,2	36,4
women (%)	84,5	98,6	56,3	74,6	42,3	36,6	98,6	81,7	11,3	56,3	53,5	37,8

Overweight and obese people in fat and water-soluble vitamin supplements do not meet international recommendations. The desired intake value for men in obese groups did not reach 100% for vitamin D and folic acid, while for other vitamins the proportion of men and women was worryingly high. Examining BMI groups, the vitamin uptake per kg body weight decreases significantly with the increase by BMI (ANOVA p<0.01-0.001). The results are characteristic for both sexes. The morbid obese group had a lower supply of both sexes.

Recruitment of vitamin D intake according to BMI is no different, but women are less absorbed (p<0.05). The recommended vitamin D uptake value (5 µg/day) is 86.5% in men and 97.3% in women. There is no difference between age groups and age-adjusted vitamin D intake. There is a difference between the obesity overweight and morbid obesity in men (mean: 1.41 SD: 1.24 vs. 0.80 SD: 0.50 p<0.05) in the uptake of vitamin D with 1000 kcal content in men. There is no difference in the group of women. There is no difference in the vitamin D dose for 1000 kcal. The age-adjusted vitamin D/1000 kcal difference between the obese and overweight obese group in men (1.47 95% CI 1.14-1.80 vs. 0.78 95% CI 0.51-1.06 p<0.05). There is no difference in women.

Vitamin D uptake per kg body weight per BMI group was linear in both men (ANOVA p<0.01) and in women (ANOVA p<0.01), by gender no difference. The age-adjusted vitamin D intake/body weight per BMI group decreased linearly for both men (ANOVA p<0.01) and for women (ANOVA p<0.01). Vitamin D intake showed a negative correlation with age (r=-0.199 p 0.05), positive correlation with plant uptake (r=0.461 p<0.001). Positive correlation was observed in females (r=0.318 p<0.001) with plant fat uptake. Vitamin

A in men (r=0.230 p<0.05) in women (r=0.379 p<0.001) showed a positive correlation with vitamin D intake. The amount of vitamin D added to 1000 kcal showed a negative correlation between the BMI- (r=-0.275 p<0.01), body weight (r=-0.282 p<0.01), animal fat uptake (r=-0.250 p<0.05). In women, positive vitamin A correlation was observed (r=0.276 p<0.001). Vitamin D uptake showed a positive correlation with plant fat uptake in men (r=0.271 p<0.01) and women (r=0.230 p<0.01), and with vitamin A in men (r=0.194 p<0.05) and women (r=0.375 p<0.01). The role of vitamin D-regulated calcium on the basis of literature data is significant in obesity. According to literature data, the daily calcium uptake is 1,000 mg. In my study, of the 104 men, 72 people had calcium uptake below 1000 mg (69.2%). Out of the 183 women, 139 people had calcium uptake below 1000 mg (76.0%).

New scientific results

1) In addition to energy-rich and adverse nutrition and physical activity decline, another 30 significant environmental factors play a role in obesity. In the unique treatment of obesity, programs based on lifestyle interventions basically are suitable, and the consideration of further modifiable environmental factors is a task of prevention at social level.

2) In addition to the increasing amounts of macro-nutrient uptake by BMI groups, the proportion of the same energy ratio was detectable in men, with a slightly significant increase in fat uptake rates as the carbohydrate uptake rate decreased in women. Carbohydrate uptake did not reach the recommended 50 en% in either gender or group.

3) Above the weight, especially in men, is not typical of certain nutrients that are higher than in normal body weight. The difference between the morbid obese group in both sexes is significant, in the case of men there is a significant increase in added sugar, but in women the intake of fat is the same as that of men. Fat / protein ratio increases in both sexes with obesity, in particular a significant increase in morbid obesity. Morbid obese compared to normal weight compared to all amino acids showed significantly higher values.

4) Fat uptekes in grams are significantly increasing in men ANOVA p<0.001, and women p<0.01. In the pairwise comparison, only the morbid obese group is greater (p<0.01) than the normal weight. Saturation of the saturated fatty acid in grams, measured by body mass index, is significantly increased in both sexes. In the pairwise comparison, women were obese (p<0.01) and morbid

($p<0.001$) in men with morbid obese ($p<0.001$) significantly increased. There was no discrepancy in the fat and saturated fatty acids according to the body mass index (ANOVA: $p<0.01$) and saturated fatty acid (ANOVA: $p<05$) in the energy ratio by body weight index in a group study increased linearly with the values of men. MUFA and PUFA in energy ratio NS. The increase in essencial fat did not show any significant change, but in women only in the morbid obese group significantly ($p<0.05$) increased. According to BMI groups of both sexes, there is a very low n-3 intake recording with increasing n-6 recording.

5) The intake of protein in men and women in the body weight index was significantly increased linearly (ANOVA $p<0.001$) by the BMI of men and women, and the protein ratio in energy % was unchanged (ANOVA NS). Pairwise study of body mass index groups did not show any significant change. A large increase in amino acids was observed in BMI groups in both sexes.

6) Fat and water-soluble vitamin supplements do not meet international recommendations in any of the groups. For men to be highlighted, in addition to vitamin D and folic acid, Vitamin A and Panthenic Acid, among them vitamin D, folic acid, vitamin A, panthotenoic acid, vitamin B1, vitamin E, biotin and the value of vitamin B12.

4. CONCLUSIONS AND SUGGESTIONS

Two main factors contributing to the development of obesity include calorie over-nutrition and physical inactivity, and 30 environmental factors can be identified, which is essential to prevent obesity and to treat obesity's public health status.

The results of the food intake confirm that dietary management of obesity is essential to reduce energy consumption. It is especially important to take into consideration the dietary composition of fatty acids, including the addition of omega-3 fatty acids to reduce cardiovascular risk factors.

Increased complex carbohydrates and increased dietary fiber intake, especially in obesity and morbid obesity, reduction in the intake of simple carbohydrates and added sugar can be recommended in obesity dieting. Low vitamin intake levels raise diet modification and increase the need for supplementation. Vitamin D supplements and increased calcium intake appear to be particularly necessary for morbid obesity.

It is necessary to determine the degree of reduction of total energy consumption, the inclusion of a more favorable nutrient composition and an individual assessment based on age, gender, physical activity and morbidity. Dietary therapy should be combined with dietary management of obesity and associated diseases.

Energy-rich and disadvantaged nutrition is essential, but it is also possible to ignore social pressures that shape the nutritional environment and drive consumers to increased nutrition. The rich offer and advertising of food industry and commerce as well as the fast-serving business networks are all about to boost energy. A healthy lifestyle follows a personal and family or narrower community pattern, but society is responsible for oversupply.

There is insufficient efficiency in raising awareness of a healthy lifestyle, including eating habits and especially physical activity. With the help of simple recommendations and exemplary practical activities, the child's obesity can be relied upon to provide the player with physical activity and to provide obese children with disadvantages due to weight gain in sporting activities.

In the prevention of obesity, in addition to balanced nutrition, particular attention should be paid to the development of adequate space for children and adults to make playgrounds, walking paths, bicycle paths, sports facilities, accessible on-demand facilities available. The proper design and modification of the built environment can be influenced by town planning and public space (sports and service centers) planning practice.

In the design of the built environment, a stronger consideration of health effects is recommended. A mixed-use settlement structure is beneficial, where transport and parking facilities, green areas, parks, food purchasing, sports and cultural facilities are well organized. For the aim of health promotion, the air purity of pedestrian routes, the non-allergenic vegetation, drinking pots, benches, compartments, the use of appropriate covers and the safety of the environment can support physical activity. In designing public buildings, consideration should be given to the design of large, attractive staircases, the positioning of elevators in the background, the provision of adequate building materials, building structure, interior temperature and air movement.

Decisive steps are needed to reduce the presence of endocrine disruptor materials in our artificial environment with regard to the likely exposure of the population. In addition to the public health prevention activities, the joint effort of industry, agriculture and trade is needed to modify the current situation and eliminate the environmental burden. Authority information and personal information are also crucial to the issue.

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