



Original Contribution

MULTIPLE APPROACHES IN INITIAL OBESITY TREATMENT

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SUMMARY

Obesity is a multi-factorial disorder, which is often associated with many other significant diseases such as diabetes, hypertension and other cardiovascular diseases, osteoarthritis and certain cancers. The management of obesity will therefore require a comprehensive range of strategies focusing on those with existing weight problems and also on those at high risk of developing obesity. This study assessed the effects of multiple approaches of a short-term clinical-based weight management programme. We studied overweight and obese women. The diagnostic protocol included anthropometric data, body composition analyses, blood analyses, cardiologic, dietologic and physiotherapeutic situations. Patients maintained low-calorie diet, intensive daily exercise programme and physiotherapy requirements. The behaviour modification consisted of lectures and individual psychotherapy. Weight loss for the group was 2.57 kg. The fat-mass loss was 1.25 kg, free-fat mass decreased by 1.31 kg. Reductions in waist and hip circumferences for the group were 3.9 cm and 3.09 cm respectively. Basal metabolic rate was significantly reduced ($p < 0.001$). Patients had improved indices that included, total cholesterol, HDL cholesterol, fasting glucose, and blood pressure. A multidimensional approach involving physical therapists and other health care providers, with individualized treatment options, is important for successful weight management.

Key words: obesity treatment, short-term weight management programme

INTRODUCTION

Obesity is a worldwide epidemic (1, 2, 3) that is characterized by excess adipose tissue and which contributes to numerous chronic diseases and early mortality (4, 5, 6). This epidemic has received both national and international attention because of obesity's detrimental impact on health, the enormous economic burden it imposes (7), and its increasing prevalence. Obesity is a global problem, affecting an estimated 300 million people worldwide. Its prevalence is increasing in both developed and developing countries of the world (8, 9, 10). Obesity is pervasive, affecting people of all ages and of all socio-economic levels. According to a National Research of The Nutrition in the population in Bulgaria it was discovered that in the adult population with age range, 19 to 60, 41% of males and 34% of females were overweight, whilst 22% of males and 16,6% of females

were obese (11, 12).

Obesity involves complex aetiological links between the genetic, metabolic and neural frameworks on one hand and behaviour, food habits, physical activity and socio-cultural factors on the other (13). The relative contribution of each of these factors has been studied extensively, and although genes play an important role in the regulation of body weight, the WHO concluded that behavioural and environmental factors (i.e., sedentary lifestyles combined with excess energy intake) are primarily responsible for the dramatic increase in obesity during the past two decades (14, 15).

While obesity is itself an avoidable chronic disease, it is a substantial risk factor for others. The most significant health consequences include hypertension, type 2 diabetes, cardiovascular disease, gallbladder disease, certain types of cancer and psychosocial problems (16). It also conveys increased risks of dyslipidaemia, insulin resistance, breathlessness, sleep apnoea, asthma, osteo-arthritis, hyperuricaemia and gout, reproductive hormone abnormalities,

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polycystic ovarian syndrome, impaired fertility, and lower back pain (17).

The goals of obesity treatment are to achieve and then to maintain clinically meaningful weight loss, with the ultimate goal of reducing the risk for or severity of obesity-related diseases, impairments, and functional limitations. Weight losses of 5% to 10% of initial body weight produce health benefits and are deemed by many health care practitioners to represent a clinical success (18). Effective therapeutic regimens for treating obesity should incorporate multiple approaches to encourage behavioural change or modification and creative strategies to facilitate consistent and long-term follow-through. Numerous options are available today, including reduced-energy diets, physical activity/exercise, behaviour modification, pharmacotherapy, and surgery. The treatment choice depends on the degree of obesity, the presence of co-morbidities, previous weight loss therapies utilized and the relative success of each, and the myriad characteristics of an individual's personal life (19-26).

MATERIALS AND METHODS

Subjects and Research Design

Overweight and obese women (n=308) with no overt disease were recruited to take part in the weight management programme. Subjects were recruited according to these selection criteria obtained from a pre-study medical history questionnaire: 1) in good health and with no known diseases including cancer, diabetes and coronary heart disease, 2) a body mass index (BMI) between 25 and 55 kg/m², 3) not currently on a weight loss diet and weight stable within 5% of body weight over the past year, 4) less than 30 minutes of moderate-to-vigorous exercise a day and 5) not experiencing any pain that would interfere with full participation.

All subjects were prescribed an energy-restriction diet, exercise programme and physiotherapeutic procedures for 2 weeks, with body composition and nutrient intake measured pre-study and after week 2.

Laboratory Procedures

After an overnight fast, subjects came from hotel to the laboratory (~200m) at 8:30 a.m. For determination of blood parameters, blood was drawn via an antecubital vein into a serum tube or in a tube filled with EDTA. Laboratory parameters: haemoglobin, blood glucose levels, total cholesterol, high-density

lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, triglycerides, were determined in a certified laboratory using standard methods.

Anthropometry

Height and weight were obtained using a mobile combination stadiometer-digital balance (model 225; Seca, Hamburg, Germany). Fat distribution was studied by measuring the waist and hip circumference and calculating the waist to hip ratio (WHR).

The waist circumference was measured at the smallest circumference between the rib cage and the iliac crest with the subject standing. The hip circumference was measured at the widest circumference between the waist and the thighs. The WHR was calculated by dividing the waist circumference by the hip circumference.

Body composition

In the first day of the weight management programme, and the last week of the 2-wk study, the body composition of all obese subjects was assessed. In order to ensure the predictive accuracy of these equations, subjects strictly followed each of the Tanita BIA Testing Guidelines. Before testing, subjects were required to adhere to these BIA testing guidelines: 1) to not eat or drink within 4 h of the test, 2) to maintain normal body hydration, 3) to not consume caffeine or alcohol within 12 h of the test, 4) to not exercise within 12 h of the test, 5) to not take diuretics within 7 d of the test, 6) to urinate within 30 min of the test, and 7) No testing of female clients who perceived they retained water during that stage of their menstrual cycle.

BIA measurements were taken by using the Tanita[®] leg-to-leg BIA system (model TBF – 300A). The Tanita[®] analyser measures lower-body resistance between the right and left legs as the individual stands on the electrode plates of the analyser. Subjects were measured while standing erect, on bare feet, on the analyser's footpads and wearing either a swimsuit or undergarments. The system's 2 electrodes were in the form of stainless steel foot pads. Leg-to-leg impedance and body mass were simultaneously measured as the subject's bare feet made pressure contact with the electrodes and digital scale.

The body fat monitor/analyser automatically measures weight and then impedance. Computer software (a microprocessor) imbedded in the product uses

the measured impedance, the subject's gender, height, fitness level, and in some cases age, (which have been pre-programmed), and the weight to determine body fat percentage based on equation formulas. Through multiple regression analysis, Tanita has derived standard formulas to determine body fat percentage. Tanita's equations are generalized for standard adults and athletes.

Specialist consultation

Cardiologic consultation: The nurse made the standard cardiogram and after that, subject visited the cardiologist. Cardiologist examined cardiovascular fitness, blood pressure, pulse, and gave an interpretation to cardiogram. Seated blood pressure was measured in duplicate after 10 minutes of rest, at 2 to 3 minutes apart. If the readings differed by 4 mm Hg or higher, then a third reading was taken.

Physiotherapy consultation

Physiotherapist examined the health status, especially condition of the articulations, joints pain and movement, also skin status and other diseases. Specialist determined the contraindication for physiotherapy and prescribed some physical procedures, like anticellulitis massage, thermotherapy, electrotherapy, underwater massage, etc.

Dietology consultation

All subjects had dialogue with the dietologist. Specialist determined the daily feeding, nutrition status, basal metabolic rate and gave the recommendation for diet at home. Dietologist had a talk with group on nutrition and dietetics.

Energy-Restriction Diet

Each subject's basal metabolic rate (BMR) was estimated automatically using the Tanita[®] leg-to-leg BIA system (model TBF – 300A). Obese subjects were prescribed a 1000–1200 kcal/d diet for 2 wk. The dietary menu was based on National dietary recommendations (Bulgaria). The goal of the intervention was a weight loss of 0.5–1.0 kg/week. Caloric intake was restricted using a balanced diet (~ 50% carbohydrates, ~30% protein, 20–60 g fat/day). A minimum volume intake of at least 2 l was suggested using 1.5 l mineral water or 0.5 l herbal tea with soft diuretic and laxative effect as beverage. Intentional weight loss was controlled by weight control and by bioelectric impedance analysis at indicated

times. Caloric intake restriction was supported by a behavioural programme, which consisted of group sessions.

Training programme

In addition to weight management programme, subjects underwent a regular training programme, which was performed daily per week at a level of 60–80% of their initial heart rate reserve. The subjects were grouped into 2 training groups according to intensity and difficulty of exercise. The exercise routine consisted of 20 min of morning gymnastics, 30 min complex of curative aerobic gymnastic, 60-90 min outdoor walking or jogging (terenkur), aqua-aerobic exercises in swimming pool with mineral water (25 min), individual analytic training (up to 60 min), cycle ergometry (60 W, up to 30 min) and dance teaching (up to 120 min). Subjects wore the pedometer (Tanita[®]) every day of study and daily distance was recorded in an exercise log. A trained exercise physiologist supervised all exercise sessions, and performed random checks of heart rate. Each exercise session was supervised to ensure correct technique and to monitor the appropriate amount of exercise and rest intervals. No injuries or complications were reported from the exercise testing and training program.

Physiotherapy programme

All subjects submitted to some further procedure after the physiotherapy consultation and assessment of health status. The daily procedures were as follows: manual massage of the targeted zones with anticellulitic cream (15 min), underwater massage (20 min), electrotherapy procedure (30 to 45 min).

Behaviour modification

The behavioural component of the intervention was based on the principles and processes of the National Recommendation for Healthy Lifestyle (Bulgaria). Motivational and behavioural principles to modify eating patterns, to initiate and/or continue moderate exercise and to increase the activities of daily living were introduced. We provided several daily educational classes for modifying the physical environment, thinking patterns and social supports. An important component of behaviour change was self-monitoring of that behaviour.

RESULTS

Subjects complying with all aspects of the study design included 308 overweight and obese women. Baseline characteristics of subjects enrolled in the trial are shown on **Table 1**.

The subjects' ages were principally on a range of 22 to 62 years; BMI was within a range of overweight to extreme obesity with BMI 54.9. Fat mass content was within the

borders of normal to obese variant, and the average fat mass in the body was 41% - this was the obese content for women in age range 20 to 59 years and over fat for women from 60 to 79 years. Waist circumference was from normal to risk contents, as the average circumference was in the risk division, over the 80 cm benchmark.

Table 1. Subject characteristics (n = 308)

<i>Subject Characteristics</i>	<i>Mean ± SD</i>	<i>Range</i>
Age (years)	42.66 ± 10.87	22 - 62
Height (m)	162.20 ± 5.81	147 - 173
Weight (kg)	86.74 ± 17.46	58.00 – 140.8
Body mass index (kg/m ²)	32.94 ± 6.51	25.10 - 54.90
BMR (kcal)	1565.15± 187.78	1244 - 2151
BMR (kJ)	6520.72 ± 670.55	5249 – 8001
Impedance (ohms)	505 ± 66	345 – 750
Fat mass (%)	41.25± 4.86	31.30 – 51.50
Fat mass (kg)	36.47 ± 11.33	19.40 – 70.5
Fat-free mass (kg)	50.25 ± 6.83	38.6 - 77
Waist circumference (cm)	94.28 ± 12.56	77 – 129
Hip circumference (cm)	116.33 ± 11.94	98 - 156
WHT	0.81 ± 0.06	0.64 – 0.95

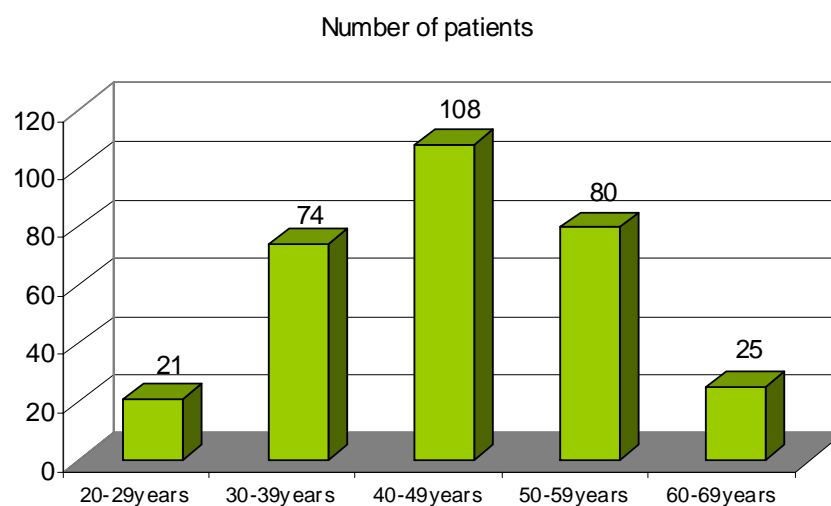


Figure 1. Distribution of the patients by age (n =308)

It is evident from the above **Figure** that the highest number of patients was in the age range of 40 to 59.

Figure 1 shows also that a higher proportion of the overweight subjects were women (38%) and also prone to Stage I obesity (42%). Multiple approaches open up a

chance for identification of the co-morbidity and complication of obesity. New-found variable in the lipid profile is significant – 39 % of the women with high value of the cholesterol and triglycerides in blood.

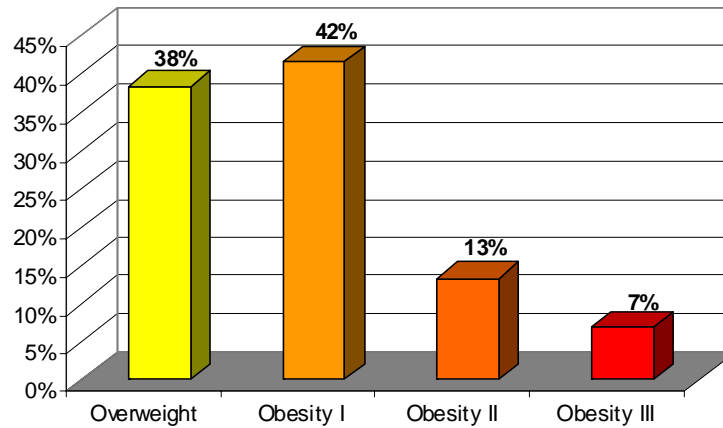


Figure 2. Distribution of the patients by BMI (n =308)

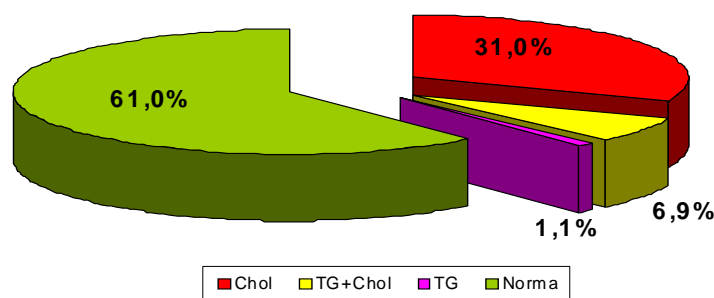


Figure 3. Correlation of the women with hypercholesterolaemia, hyperlipoproteinaemia and mixed hyperlipidaemia and normal content of lipids (n =308)

The value of total cholesterol over 5.2 mmol/l in group of overweight and obese women is 31%, enlarged value of the cholesterol over 5.2 mmol/l and triglycerides over 2.3 mmol is 6.9% of women. Only 1.1% of the group have triglyceridemia.

The patients with disturbed glucose tolerance is 11.4 % (fasting glucose over 6,11 mmol/l). The biggest part of patients with disturbed glucose tolerance has a BMI over 23-87%, and only 13% have a normal weight. We referred the patients with disturbed

glucose tolerance to additionally examination after programme.

Weight and anthropometric changes were significantly decreased; weight loss was 2.57 kg (3% of total average group weight for 2 wk). The waist circumference diminish in comparison with baseline with 3.9 cm and the hip circumference – with 3 cm. A material changes presents circumferences of body on **Table 2**.

Table 2. Weight and anthropometric changes from baseline to post-intervention in a study group (n =308)

Subject Characteristics	Baseline (SD)	Post (SD)	Difference
Weight (kg)	86.74 (17.46)	84.18 (16.73)	- 2.57
Body mass index (kg/m ²)	32.94 (6.51)	31.93 (6.30)	- 1.00
Waist circumference (cm)	94.28 (12.56)	90.38 (12.83)	- 3.90
Hip circumference (cm)	116.33 (11.94)	113.23 (11.74)	- 3.09
Waist-to-hip ratio	0.81 (0.06)	0.79 (0.14)	- 0.02

The results of body composition change are presented on **Table 3**. Mean body mass decrease was 2.57 kg with free fat mass accounting for about 51% of this change. This is adequate result after the first 2 wk of intensive weight reduction programme,

because a main loss is total water in the body, 0.96 kg (73% of reduced free fat mass). The content of fat mass is reduced with 1.25 kg on the average (49% of the reduced tissues). In the end of intervention basal metabolic rate was decreased.

Table 3. Body composition changes from baseline to post-intervention in a study group using the Tanita® analyzer (n =308)

<i>Subject Characteristics</i>	<i>Baseline</i>	<i>Post</i>	<i>Difference</i>
Fat mass (%)	41.25 (4.86)	41.06 (5.19)	- 0.19
Fat mass (kg)	36.47 (6.83)	35.22 (11.48)	- 1.25
Fat-free mass (kg)	50.25 (6.83)	48.94 (5.84)	- 1.31
Total body water (kg)	36.78 (5.00)	35.82 (4.28)	- 0.96
BMR (kcal)	1565.15(187.78)	1547.37 (176.57)	- 17.79
BMR (kJ)	6520.72 (670.55)	6459.64 (661.73)	- 61.09

CONCLUSIONS

Bulgarians are preoccupied with weight loss. There has been a dramatic increase in the prevalence of overweight and obesity in the past 20 years and all indications are that the problem will get worse in the coming decades [12]. This paradox suggests that new approaches to weight management are warranted. We developed a multidisciplinary weight management programme, including exercise, nutrition education, physiotherapeutic procedures and behaviour change. The programme focused on healthy lifestyle changes rather than weight loss per se. The goal of the programme was to promote long-term changes in diet and exercise habits as a way of improving health and achieving a moderate weight loss. The behavioural component of the weight management programme was essential, as it provided participants with strategies on how to change their lifestyle behaviours and how to maintain those changes. The analysis of achieved results indicates that a multidimensional approach involving physical therapists and other health care providers, with individualized treatment options, is important for successful obesity treatment.

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