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CLINICAL STUDY

Effects of basic traditional Chinese diet on body mass index, lean body mass, and eating and hunger behaviours in overweight or obese individuals

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Abstract

OBJECTIVE: To compare the effects of a basic traditional Chinese diet with a Western standard diet on body mass index (BMI), lean body mass (LBD), and eating and hunger behaviours.

METHODS: A sample of 284 patients were randomized into 2 groups: group A (n = 142) followed a basic traditional Chinese diet (BCTD) and group B (n = 142) followed a Western standard diet (WSD). Both diets were set at approximately 1200 calories. The patients enrolled were compared before treatment and 6 weeks after treatment, and then follow-ups were made at 1 year and 5 years.

RESULTS: In the BCTD group, BMI decreased by 0.46 kg/m^2 and LBM by 0.25 kg, versus respectively 0.28 kg/m^2 and 0.41 kg in the WSD group. Findings of eating self-assessment, hunger measurement and psychophysical indices of health were also in favour of the BCTD.

CONCLUSION: Outcomes show that the BCTD has a better effect on BMI and LBM, as well as over the medium/long term, and provides stronger psychophysical support to obese patients.

Key words: Obesity; Overweight; Cardiovascular diseases; Diabetes mellitus; Dietetics; Diet; Body mass index

INTRODUCTION

Preliminary studies on using nutrients of traditional Chinese dietetics in diets for the treatment of weight excess, developed in universities[1-5] as well as in competent institutes[6-9] and presented in congresses, show interesting effects on weight loss, modifications of adipokines and improved compliance of patients to this new dietary approach. Preliminary work conducted in a sample of 694 subjects, and published in 2013,[10] confirmed that the basic Chinese traditional diet (BCTD) compared with a Western standard diet (WSD), both at approximately 1200 calories, produced better results in terms of weight loss and patient compliance. Furthermore, it better preserved lean body mass (LBM). In more than one meeting, an objection made to this work was that, despite the fact that both were 1200-calorie diets, the BCTD provided a marked caloric intake at breakfast (727 calories vs 251 of the WSD).

Additionally, studies have demonstrated that the BCTD markedly improves symptoms of "anxious de-

pression", "endogenous depression" and "anxiety", according to data measured with the Minnesota Multiphasic Personality Inventory (MMPI) test. It is worth considering that the MMPI highlights psychometric aspects of great interest, yet it might not be the most suitable test to disclose the psychophysical support that the BCTD is likely to provide. This kind of support could be a substantial innovative contribution that this diet can give to dietetics for the treatment of obesity. Thus, the aim of the present study was to evaluate the effects of the BCTD on overweight individuals compared with the WSD.

MATERIALS AND METHODS

Subjects and diet specifications

A total of 284 overweight or obese individuals (112 males and 172 females, mean age 47 ± 8.7 years) were recruited between January 1, 2008, and May 20, 2008, at the Paracelsus Clinic of Rome. The study was approved by the Ethics Committee of the "Inter-university Commission for Research in Acupuncture", a university-level organization established in 1991. All individuals agreed to participate in the study by signing an informed consent form, created by the Ethics Committee.

Inclusion criteria

Age between 25 and 70, BMI > 25, absence of pathologies that require concomitant therapies.

Exclusion criteria

Participants were excluded if they suffered from endocrinopathies, cardiovascular and/or metabolic disorders, such as frank diabetes, hypercholesterolemia, hypertension, or when normal values of blood sugar, blood pressure or cholesterol depended on medical control. Participants were randomly selected into two groups (142 in each): group A (BCTD) and group B (WSD). Randomization of groups A and B was simply obtained through the use of random numbers generated by the "random (min; max)" function of the spreadsheet Microsoft Excel. The random selection was performed taking into account the BMI, so as to create homogenous groups with respect to the BMI value; homogeneity was also maintained in the number of subjects of single subgroups after drop out: subgroup A1 (36 subjects) and B1 (34 subjects) with BMI ≤ 29.9; A2 (36 subjects) and B2 (36 subjects) with BMI 29.9 < BMI < 40; A3 (36 subjects) and B3 (35 subjects) with BMI ≥ 40.

The BCTD was defined in terms of types of food and the calories contained in the three meals (breakfast, lunch and dinner (Table 1), and adopted typical foods of traditional Chinese dietetics. The Western standard diet (WSD) was defined as well in terms of foods and calories taken in the three main meals (breakfast, lunch and dinner), but adopted typical foods of the Western diet (Table 2).

Outcome measures

BMI and LBM: BMI and LBM were measured before treatment (T_0) and 6 weeks after treatment (T_1) using bioelectrical impedance analysis (bioelectrical impedance scale, model BC- 418 MA Ⅲ Tanita Corporation, Tokyo, Japan).

Eating behaviours: the questionnaire for self-assessment of eating behaviours (Table 3) was used before and after six weeks of dietary intervention. Each of the 22 questions, grouped into a total of eight items (Ⅰ to Ⅷ), could receive a score of 1 to 5 points. The minimum possible score was, therefore, 22 points; the maximum was 110 points. The assessment was made by calculating the average variations of single scores, obtained by deducting scores before treatment from scores after treatment. The larger this value is, the greater the improvement in eating behaviours.

Hunger behaviour: a questionnaire for the measurement of hunger (Table 4) was used before and after the 6-week diets. Scores range between 1 and 5. The assessment was made by calculating the average score variations, obtained by deducting the scores before treatment from the scores after treatment. The higher this value is, the more improved the sensation of hunger.

The physical health index (PHI) and the mental health index (MHI) of all patients were measured by SF-36 questionnaire before and after 6 weeks of dietary treatment. The SF-36 questionnaire is a well-known tool that allows for the assessment of the state of general health using 36 questions. The results obtained from the patient's responses before and after the dietary intervention are represented by 8 scores/scales, each addressed to quantify a specific aspect of health status. The two indices PHI and MHI that are derived from the 8 scales allow for summarizing the results of these scales into two numbers. Physical functioning, physical role functioning, bodily pain, and general health perceptions (first 4 scales) reflect the overall physical health. Vitality, social functioning, emotional role functioning, and mental health (second 4 scales) assess aspects of psychological/emotional health. The values of the two indices, PHI and MHI, allow a more accurate assessment of the psychophysical condition than the MMPI. Also, in this case, higher scores indicate a better level of perceived health. Level 50 represents the average value of perceived health in the Italian population. Values above 50 indicate that perceived health is better than average and vice versa. In this study, we used a demonstration version of the SF-36 available online, which takes into account sex and age.

Statistical analysis

SPSS (PASW statistic 18, Version 18.0.0 SPSS Italia SRL, authorized by SPSS Inc.) and Excel were used to analyse paired and unpaired data. Student's t was used to test the differences between the two groups. $P < 0.05$ is statistically significant.

Table 1 Basic Chinese traditional diet

Item	Ingredient	Weight (g)	Calories (Kcal)		
			Single ingredient	Subtotal (or average)	Total meals
Breakfast	Milk	200	128.00	617.00	
	White bread type 0	90	247.50		
	"Robiola" cheese	50	169.00		
	Raw Parma ham	50	72.50		
			Breakfast total calories		617.00
Lunch	Soybean	27.00		189.00	
	Black Beans	3.60			
	Shallot powder	3.30			
	Black sesame	3.00			
	Buckwheat flour	3.00			
	Skim milk	2.76			
	Barley	2.40			
	Jujube	2.40			
	Corn flour	1.80			
	Oat flour	1.80			
	Haricot Bean	1.80			
	Lotus seed	1.50			
	Mushroom	1.20			
	Almond	1.20			
	Kelp	1.20			
	Salt	0.60			
	Ginger Powder	0.54			
	Soy phospholipids	0.36			
	Calcium carbonate	0.42			
	Shallot flavour	0.12			
	Raw fennels	500	45.00	71.30	
	or boiled chicory	500	60.00		
	or boiled zucchini	500	135.00		
	or boiled Swiss chard	300	108.00		
	or boiled green beans	300	75.00		
	or tomato salad	300	51.00		
	or sautéed field mushrooms	250	60.00		
	or frozen spinach	160	36.80		
	Olive oil = 2 teaspoons	10.00	90.00	90.00	
			Lunch total calories		350.30
Supper	Soya	27.00		189.00	
	Haricot and black beans	5.40			
	Scallion	3.30			
	Buckwheat	3.00			
	Black sesame	3.00			
	Skimmed milk	2.76			
	Barley sprouts	2.40			
	Chinese jujube	2.40			
	Corn	1.80			
	Oats	1.80			
	Lotus seeds	1.50			
	Lentinus edodes (mushroom)	1.20			
	Almonds	1.20			
	Kelp seaweed	1.20			

Table 1 Basic Chinese traditional diet (continuted)

Item	Ingredient	Weight (g)	Calories (Kcal)		
			Single ingredient	Subtotal (or average)	Total meals
Supper	Ginger	0.54		189.00	
	Fish	0.42			
	Fish oil	0.60			
	Scallion aroma	0.12			
	Raw fennels	500	45.00	71.30	
	or boiled chicory	500	60.00		
	or boiled zucchini	500	135.00		
	or boiled Swiss chard	300	108.00		
	or boiled green beans	300	75.00		
	or tomato salad	300	51.00		
	or sautéed field mushrooms	250	60.00		
	or frozen spinach	160	36.80		
	Olive oil = 1 teaspoon	5.00	45.00	45.00	
			Supper total calories		305.30
			Day total calories		1272.60

RESULTS

Both groups had dropouts, mainly related to the difficulty of following a pre-established diet (Table 5, 34 subjects in group A, 37 subjects in group B).

Participants of group A were studied at the beginning and after 6 weeks of treatment with the 1200-calorie BCTD, determined by fixed percentages of macronutrients in terms of proteins (31.10%), carbohydrates (33.30%) and fats (35.70%).

Participants of group B were studied at the beginning and after 6 weeks of treatment with a 1200-calorie WSD with percentages of macronutrients similar and comparable with the BCTD in terms of proteins (32.00%), carbohydrates (34.50%) and fats (33.20%).

The outcomes of BMI, LBM and eating behaviours at T_0 and T_1 are shown in Table 6.

Tables 7 and 8 show the outcomes of BMI and LBM at 1 year for the two groups and the partial outcomes in subgroups A1 and B1 (BMI ≤ 29.9), A2 and B2 (29.9 < BMI < 40), A3 and B3 (BMI ≥ 40).

The follow-up at 5 years highlighted that the number of patients that still had BMI and LBM unchanged were 28 in group A (BCTD) versus only 6 in group B (WSD).

DISCUSSION

The loss of LBM, determined by bioelectrical impedance analysis, showed a high level of significance, being lower in group A than in group B (P = 0.00083). This result confirms that the BCTD is able to give particular physiological support to obese patients, because it preserves the LBM even while losing weight. In the literature, assessment of the loss of LBM as measured by bioelectrical impedance analysis is shown to be a reliable indicator; however, the loss of fat mass should always be studied in relation to water weight and by paying utmost attention in the detection methods to obtain reliable data.[12,13]

A second significant finding is that from the data generated from the SF 36 questionnaire. In the BCTD group, the PHI and MHI scores reached substantially normal values not far from 50, which is considered an average value of perceived health in the Italian population, while in the WSD group the above indices improved but did not reach that level. Taking into account the outcomes of the SF-36 questionnaire, a valid tool in research used for many years to assess physical and mental health status as perceived by the patient, and the results obtained in previous studies using the MMPI and a lower loss of LBM, we can confirm that important physical and psychological support is provided by the BCTD. This is a key factor according to traditional Chinese medicine because it asserts that in obese people the functions of absorption and detoxification are seriously weakened and deficient.

The partial values of subgroups A1, A2 and A3 confirm the benefits of the BCTD but provide additional considerations. In particular, the comparison between group A2 and group B2 shows a remarkable difference in patients that maintained BMI and LBM at one year (22 of the BCTD group versus 6 of the WSD group). Also notable is the difference at 5 years (16 of the BCTD group versus 3 of the WSD group). The lower result obtained with conventional diets in this range of BMI may be ascribed to the fact that marked overweight determines complex problems that more easily undermine the results of a diet. The best result obtained with the BCTD compared with patients treated with conventional diets clearly shows that traditional Chinese dietetics are very suitable not only for patients who are overweight, but also, and even more so, in the case of a remarkable weight excess (BMI > 29.9). This

Table 2 Western standard diet

Item	Ingredient	Weight (g)	Calories (Kcal)		
			Single ingredient	Subtotal (or average)	Total meals
Breakfast	Milk	200	128.00	617.00	617.00
	White bread type 0	90	247.50		
	"Robiola" cheese	50	169.00		
	Raw Parma ham	50	72.50		
	Breakfast total calories				
Lunch	Pasta	50	68.5	87.70	387.70
	or potatoes	120	102.0		
	or bread	30	82.5		
	or canned chickpeas	100	100.0		
	or canned "borlotti" beans	100	91.0		
	or canned lentils	100	82.0		
	Veal or beef	120	127.2	134.40	
	or chicken breast or leg without skin or turkey	120	154.8		
	or lean pork or rabbit	120	175.2		
	or eggs	120	153.6		
	or fresh lean fish	150	106.5		
	or strained tuna in oil	80	153.6		
	or cooked or raw lean Parma ham or "bresaola" or speck	50	72.5		
	or light cheese (caciotta, milk flakes, jocca, Philadelphia light, etc.)	50	131.5		
	Raw fennels	500	45.0	71.40	
	or boiled chicory	500	60.0		
	or boiled zucchini	500	135.0		
	or boiled Swiss chard	300	108.0		
	or boiled green beans	300	75.0		
	or tomato salad	300	51.0		
	or sautéed field mushrooms	250	60.0		
	or frozen spinach	160	36.8		
	Olive oil = 1 teaspoon	5.00	45.00	45.00	
	Peeled apple	100	53.0	49.20	
	or strawberries	200	54.0		
	or oranges	150	51.0		
	or pears	100	35.0		
	or clementines	100	53.0		
	Lunch total calories				
Supper	Veal or beef	120	127.2	134.40	250.80
	or chicken breast or leg without skin or turkey	120	154.8		
	or lean pork or rabbit	120	175.2		
	or eggs	120	153.6		
	or fresh lean fish	150	106.5		
	or strained tuna in oil	80	153.6		
	or cooked or raw lean Parma ham or "bresaola" or speck	50	72.5		
	or light cheese (caciotta. milk flakes, jocca, Philadelphia light, etc.)	50	131.5		
	Raw fennels	500	45.0	71.40	
	or boiled chicory	500	60.0		
	or boiled zucchini	500	135.0		
	or boiled Swiss chard	300	108.0		
	or boiled green beans	300	75.0		

Table 2 Western standard diet (continuted)

Item	Ingredient	Weight (g)	Calories (Kcal)		
			Single ingredient	Subtotal (or average)	Total meals
Supper	or tomato salad	300	51.0	71.40	
	or sautéed field mushrooms	250	60.0		
	or frozen spinach	160	36.8		
	Olive oil = 1 teaspoon	5.00	45.00	45.00	
		Supper total calories			250.80
	Day total calories				1.255.50

(Dr Sibilia-Dr Leonetti) Date .....

Table 3 Eating behaviour questionnaire

Patient		Very low	Low	Normal	High	Very high
I	My interest for food generally is	o[a]	o	o	o	o
II	My appetite in general is	o	o	o	o	o
III	My sense of hunger….					
	1. before breakfast is	o	o	o	o	o
	2. before lunch is	o	o	o	o	o
	3. before dinner is	o	o	o	o	o
	4. before sleeping is	o	o	o	o	o
IV	My desire to eat…					
	1. at breakfast is	o	o	o	o	o
	2. in the morning is	o	o	o	o	o
	3. at lunch is	o	o	o	o	o
	4. in the afternoon is	o	o	o	o	o
	5. sweets, chocolate, etc.	o	o	o	o	o
	6. bread, pasta, pizza, etc.	o	o	o	o	o
V	My feeling of satiety…					
	1. after breakfast is	o	o	o	o	o
	2. after lunch is	o	o	o	o	o
	3. after dinner is	o	o	o	o	o
VI	My impulse to eat when					
	1. I'm bored is	o	o	o	o	o
	2. I'm nervous is	o	o	o	o	o
	3. I'm annoyed is	o	o	o	o	o
	4. I'm depressed is	o	o	o	o	o
	5. I'm worried is	o	o	o	o	o
VII	My tendency to binge is	o	o	o	o	o
VIII	My habit to eat voraciously is	o	o	o	o	o
	SCORE	1	2	3	4	5	6	7	8

Notes: [a]The small square is when a mark should be written in correspondence of the level selected (very low, low, …); The score row is where the single scores of the above 8 items are reported, their sum indicates the total score.

Table 4 Questionnaire for hunger measurement

Question	No.
Do you think your hunger is increased?	1
Do you think your hunger is very increased?	2
Do you think your hunger is very increased and you are hungry even 1-2 h after meals?	3
Are you insatiably hungry right after meals or during the night?	4
Are you insatiably hungry right after meals and during the night?	5

indicates that the BCTD is a fundamental tool when weight excess has reached the level of obesity.

A final aspect to be mentioned is that in the BCTD group as many as 28 subjects maintained BMI and

Table 5Comparison of groups A and B after drop-out

Item	Group A (BCTD)	Group B (WSD)
Subject (*n*)	142	142
Drop out	34	37
Subject after drop out (*n*)	108	105
Male (*n*)	38	42
Female (*n*)	70	63
BMI (kg/m^2)	35.7±7.8	35.3±8.1
LBM (kg)	17.3±2.8	17.0±2.8

Notes: BCTD: basic traditional Chinese; WSD: Western standard diet. BMI: body mass index; LBM: lean body mass. N.: number. BCTD is a Chinese Traditional Diet except for breakfast which is based on salty Western food. The WSD is a Mediterranean Diet based on food with a high level of nutrients.

LBM at 5 years, while 6 subjects of the WSD group obtained the same result.

The WHO data report that at 5 years, no more than 5% of individuals on a diet maintains the weight loss. The fact that the weight loss was maintained by almost 10% of the WSD subjects may be the result of the particular attention that was dedicated to diet by participants in this trial (roundtables, regular phone calls by dieticians and doctors). However, the more than 25% of participants that maintained weight loss at 5 years in the BCTD group should certainly be the result of the psychophysical support given by the BCTD and not just the attention given to the diet by participants.

Obesity is one of the most important cardiovascular risk factors[14] and is growing in prevalence in industrialized populations. In the United States, rates of obesity have almost doubled in the last 20 years, reaching approximately 34% of the population and involving children as well.[15] In Europe, the percentage drops to 15%, with large differences between countries. In addition to being a risk factor for cardiovascular diseases, diabetes mellitus, hypertension and dyslipidemia, obesity also leads to a significant increase in the incidence of bone and joint, gastrointestinal, biliary, dermatological, respiratory and neoplastic diseases. It is, therefore, important to investigate alternative paths in dietetics, such as the one provided by the BCTD used in this study. Additionally, medical approaches to the diet, which is an essential part of human physiopathology, must ac-

Table 6 Comparison of BMI, LBM and eating behaviours in the two groups A and B

Item	Group A (BCTD) (*n* = 142)	Group B (WSD) (*n* = 142)	*P* value
BMI (kg/m^2)	0.46	0.28	0.04800
LBM (kg)	0.25	0.41	0.00083
Eating behaviour score	34±8	12±5	0.00056

Notes: BCTD: basic traditional Chinese; WSD: Western standard diet; BMI: body mass index; LBM: lean body mass. BCTD is a Chinese Traditional Diet except for breakfast which is based on salty Western food. The WSD is a Mediterranean Diet based on food with a high level of nutrients.

Table 7 Comparison of PHI and MHI values in groups A and B before treatment (T_0) and after six weeks of treatment (T_1), worked out from SF-36 questionnaire

Group	*n*	Time	PHI	Variation T_0-T_1	Time	MHI	Variation T_0-T_1
A	108	T_0	29±8	19.99	T_0	26±10	21.63
		T_1	49±12	*P* = 0.0038	T_1	48±13	*P* = 0.043
B	105	T_0	29±18	5.48	T_0	27±17	10.60
		T_1	34±17	*P* = 0.12	T_1	38±8	*P* = 0.071

Notes: PHI: physical health index; MHI: mental health index.

Table 8 Outcomes at 1 year after diet in the two groups (*n*)

Item	Group A (BCTD)	Group B (WSD)	Group A1 (BCTD)	Group B1 (WSD)	Group A2 (BCTD)	Group B2 (WSD)	Group A3 (BCTD)	Group B3 (WSD)
Patients with decrease of BMI and LBM unchanged	56	29	19	13	22	6	15	10
Patients that have partially gained weight (< 50% of weight loss)	29	39	13	9	6	14	10	16
Patients that have gained over 50% up to their initial weight	23	37	4	13	8	11	11	13

Notes: BCTD: basic traditional Chinese; WSD: Western standard diet; BMI: body mass index. BCTD is a Chinese Traditional Diet except for breakfast which is based on salty Western food. The WSD is a Mediterranean Diet based on food with a high level of nutrients. Subgroup A1 (36 subjects) and B1 (34 subjects) with BMI ≤ 29.9; A2 (36 subjects) and B2 (36 subjects) with BMI 29.9 < BMI < 40; A3 (36 subjects) and B3 (35 subjects) with BMI ≥ 40.

knowledge the fundamental role played by lifestyle of the obese patient. Traditional Chinese Medicine attaches great importance to this aspect because the final aim of varying diet rules is a deep change of patient's lifestyle. The traditional Chinese medicine assumption that obese people are undernourished requires further exploration, potentially through the study of Borg scales, cardiovascular indices, grip test made with the Lafayette dynamometer and other parameters like the enzymatic patterns of these patients and their blood levels of micronutrients and vitamins.

In summary, the results of this study demonstrate that, despite equal calories and percentages of nutrients, participants in the BCTD group had a greater decrease in BMI, and the loss of LBM was significantly lower after 6 weeks of treatment. Moreover, indices of mental and physical health remarkably improved.

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