Weight reduction in patients with coronary artery disease: Comparison of Traditional Tibetan Medicine and Western diet

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Background: To test alternative medicine approaches with a specifically designed Tibetan dietary and behavioral program in patients with established coronary artery disease (CAD) and manifest metabolic syndrome.

Methods: This was a randomized, controlled, double-blinded, parallel group dietary and behavioral intervention study. Between December 2008 and November 2010, patients were randomly adjudicated either to evidence-based Western diet (usual care), or to Tibetan diet. We evaluated 524 patients undergoing coronary angiography. All patients were white Caucasian, presented with a body mass index (BMI) > 25 kg/m², and had evidence of metabolic syndrome. The primary endpoint was change in body weight and BMI at 6 months follow-up. Secondary endpoints included blood pressure, heart rate, intima media thickness, lipids, fasting glucose, glycated hemoglobin, fibrinogen, C-reactive protein (CRP) at 6 months follow-up and change in body weight and BMI at 12 months.

Results: Both groups of patients showed significantly reduced body weight and BMI compared to baseline (6 months, usual care weight change: −3.2 ± 3.0 kg; BMI change: −1.1 ± 1.0 kg/m²; Tibetan diet weight change: −6.2 ± 4.4 kg/m²; BMI change: −2.1 ± 1.5 kg/m²), but these changes were more pronounced in Tibetan diet compared to usual care (all, p < 0.001). Beneficial effects on weight and BMI were maintained after 12 months of follow-up (p < 0.001). Levels of total and LDL cholesterol, fibrinogen and CRP were decreased in both groups, but more pronounced in Tibetan diet (Tibetan diet vs. usual care (total cholesterol): 176.2 ± 43.7 vs. 185.1 ± 47.8 mg/dL; p = 0.024; LDL: 111.6 ± 37.8 vs. 119.4 ± 40.9 mg/dL; p = 0.026; fibrinogen: 318.3 ± 90.4 vs. 334.1 ± 87.9 mg/dL; p = 0.040; CRP: 1.2 ± 3.0 vs. 2.2 ± 4.5 mg/dL; p = 0.036).

Conclusions: Tibetan diet reduces body weight and BMI in patients with CAD and metabolic syndrome after 6 months significantly better than Western diet and may induce lipid-modifying and anti-inflammatory effects (ClinicalTrials.gov identifier: NCT00810992).

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1. Introduction

Overweight and obesity are key risk factors for mortality and morbidity from cardiovascular diseases. Since mean body mass index (BMI) values are increasing globally, interventional measures are needed to target this public health problem for primary and secondary coronary artery disease (CAD) prevention [1]. Other preventive measures such as positive effects of smoking cessation programs will not be able to compensate for the negative effects of increasing BMI in the future [2].

Changes in lifestyle, particularly with regard to nutrition and physical activity, have been shown to significantly reduce coronary atherosclerosis progression and mortality, even without the use of lipid-lowering medication [3].

Apart from low-fat diet, current lifestyle interventions to reduce body weight and thus BMI recommend nutritional programs based on low-carbohydrate and Mediterranean diets [3,4]. To date, little is known about the therapeutic effects of dietary programs to lose body weight in alternative medicine and most of these study results have been inconsistent and not convincing so far [5].

Traditional Tibetan Medicine is majorly based on aspects of nutritional and behavioral medicine and has been influenced by and, thus, considered as a synthesis of Greco-Persian, Ayurvedic Indian, and Traditional Chinese Medicine (TCM) [6]. Along these lines, the World Health Organization (WHO) acknowledged that among Chinese Han and three other minorities in China, Tibetan subjects showed the lowest BMI in a comparative study of cardiovascular diseases and alimentation [7].
The aim of this study was to test a specifically designed Tibetan dietary and behavioral program in patients with established CAD and manifest metabolic syndrome. We hypothesized that a Tibetan dietary and behavioral program adapted to food availability in the Western world would be more effective in terms of body weight reduction than current evidence-based Western diet and lifestyle recommendations for cardiovascular disease risk reduction [8,9]. In addition, therapeutic effects of weight management may be supported by proxies such as changes in blood pressure, heart rate, intima media thickness, lipids, fasting glucose, glycated hemoglobin, fibrinogen, or C-reactive protein (CRP) that were therefore evaluated as secondary endpoints [10].

2. Methods

2.1. Study population

Between December 2008 and November 2010, we screened all patients undergoing coronary angiography at the Department of Cardiology of the University Hospital Tübingen, Germany, for enrolment into this randomized, controlled, double-blinded, parallel group dietary and behavioral intervention study. This hospital is a primary care clinic that serves a catchment area of approximately 500,000 inhabitants in South-western Germany, which consists of a community with rather high socioeconomic status and education that is characterized by the lowest ischemic heart disease mortality compared to other regions of Germany [11]. Patients were eligible if they presented either for elective coronary angiography or for suspected acute coronary syndrome. To be included, patients had to have significant CAD as verified by coronary angiography and defined as stenosis of ≥50% in at least one of the major coronary arteries or their branches. Further inclusion criteria embraced the presence of overweight (defined as BMI ≥25 kg/m²) or obesity (≥30 kg/m²), according to the WHO criteria and at least two other factors defining the presence of the metabolic syndrome with an increased cardiovascular risk profile. According to the criteria of the International Diabetes Federation (IDF), these additional factors include 1) raised blood pressure (systolic ≥130 mm Hg, diastolic ≥85 mm Hg) or treatment of previously diagnosed hypertension; 2) elevated fasting plasma glucose (≥100 mg/dL) or previously diagnosed type 2 diabetes mellitus; and 3) lipid alterations such as raised triglycerides (>150 mg/dL), reduced high-density lipoprotein (HDL) cholesterol (<40 mg/dL in men, <50 mg/dL in women) or specific treatment for these lipid abnormalities [12].

Exclusion criteria were age <18 years, inability to give or lack of informed consent, pregnancy, any history of psychiatric disease, malignancy, connective tissue disease, thyroid disease, patients with end stage renal disease undergoing hemodialysis, current use of steroids, hormone replacement therapy, current signs of infectious diseases, sepsis, or cardiogenic shock at presentation.

At presentation, all patients underwent a thorough physical examination with blood pressure and heart rate measurement in a lying position, body height and weight determination using calibrated scales, a resting electrocardiogram, routine laboratory assessments including fasting glucose, glycated hemoglobin, total, low-density lipoprotein (LDL), and HDL cholesterol, triglycerides, fibrinogen, and CRP, and an echocardiogram for the determination of left ventricular ejection fraction (LVEF). Measurement of patients’ body weight was performed in the morning with the patient wearing light clothing. Mild edema were permitted at study entry.

Measurements of intima media thickness (IMT) were performed as previously described [13]. In brief, we used a Hitachi, EUB-5500 ultrasound scanner (Hitachi Medical Systems GmbH, Wiesbaden, Germany) with a 7.0-MHz linear array transducer to acquire high-resolution B-mode ultrasound images. The mean combined IMT comprised three predefined segments of 10 mm of the common carotid artery, the carotid bulb, and the internal carotid artery.

2.2. Randomization and dietary intervention

Patients were randomly assigned to receive dietary and behavioral advice according to one of two dietary programs (Fig. 1). Randomization was performed by drawing a sealed envelope with intervention assignment enclosed. Western diet (usual care) was designed from diet and lifestyle recommendations for cardiovascular disease risk reduction issued by the American Heart Association (AHA) Nutrition Committee and national societies such as the German Academy and Society of Nutritional Medicine (DAEM/DGEM) [8,9]. Tibetan diet was based on the principles of Traditional Tibetan Medicine and adapted to food availability in the Western world. Principles of the two programs are summarized in the Supplementary Tables 1 and 2. Patients received personal dietary and behavioral advice at study entry according to their assigned protocol by medical personnel trained in dietary counselling. Thus, patients were encouraged to start the respective program immediately after hospital discharge, to complete a nutritional diary, and to call the physician in charge for questions and problems. In addition, patients were contacted through auxiliary healthcare providers (medical assistants) by telephone for a structured interview of 5–10 min at least four times while in the study to test adherence, to ensure compliance, to discuss possible problems with the diet, to reconfirm the follow-up visit at 6 months, and to obtain follow-up information at 12 months.

Fig. 1. Algorithm of adjudication to dietary and behavioral study protocol. Patients were randomly adjudicated to a two-arm dietary and behavioral study, either to usual care designed from diet and lifestyle recommendations for cardiovascular disease risk reduction, or to Tibetan diet based on the principles of Traditional Tibetan Medicine. The 6-month follow-up data for primary outcome were completed in 501 patients (95.6%) including 12 patients who provided follow-up data by telephone, and the 12-month follow-up data were completed in 494 patients (94.3%). Data on secondary outcome measures were completed in 489 patients (93.3%).
The study was approved by the local ethics committee of the University Hospital Tübingen, registered at ClinicalTrials.gov (identifier: NCT00810992), and performed in accordance with the Declaration of Helsinki. All patients provided written informed consent.

2.3. Endpoints and clinical follow-up

The primary endpoint of this study was the change in body weight and BMI at 6 months of follow-up. Secondary endpoints included changes in IMT, systolic and diastolic blood pressure, heart rate, total, LDL, and HDL cholesterol, triglycerides, as well as changes in fasting glucose, glycated hemoglobin, fibrinogen, and CRP at 6 months.

An additional secondary endpoint was change in BMI at 12 months of follow-up.

At 6 months, patients were evaluated again in the outpatient department. Patients who failed to attend the follow-up visit at 6 months were contacted by telephone. The 6-month follow-up data for primary outcome were completed in 501 patients (95.6%), including 12 patients (2.3%) who provided follow-up data by telephone, and the 6-month follow-up data for primary outcome were completed in 501 patients (95.6%) who failed to attend the follow-up visit at 6 months were contacted by telephone. The 12-month follow-up data completed in 494 patients (94.3%).

Data on secondary outcome measures were completed in 489 patients (93.3%).

2.4. Statistical analysis

Sample size calculation was performed as described before [14] considering BMI as the primary endpoint. Based on a 4.29% margin of error with a confidence level of 95% and a response distribution of 50%, we estimated a sample size of 496 patients. Values are presented as mean ± standard deviation (SD). A probability value of less than 0.05 was considered as statistically significant and evaluated with appropriate non-parametric two-tailed tests. Post-hoc testing using Bonferroni's test was based on analysis of variance (ANOVA) of log-transformed data. Adjustment by possible confounders such as age, gender, classical cardiovascular risk factors, laboratory markers, clinical parameters including systolic and diastolic blood pressure, heart rate, baseline body weight and BMI, IMT, LVEF, number of coronary vessels affected according to coronary angiography as well as medical treatment at the time of hospital admission was performed by the multifactorial analysis of covariance for the decadic logarithm of body weight change (delta).

All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) software for Windows Version 19, 2010 (IBM SPSS Inc., Chicago, IL, USA).

3. Results

3.1. Study population

Our study population comprised 524 patients with CAD and metabolic syndrome. A total of 262 patients were assigned to usual care, another 262 to Tibetan diet. Details on patients' demographics are presented in Table 1. At baseline, no significant difference was detected between patients receiving usual care compared to patients receiving Tibetan diet in terms of age, gender, BMI, laboratory and clinical parameters or medication (all, p > 0.1; Table 1). The rate of adherence to the study diets was 95.2% at 6 months, and 93.9% at 12 months.
3.2. Primary and secondary endpoints

After 6 and 12 months of follow-up, patients in both groups showed significantly reduced body weight and BMI compared to baseline (6 months, usual care delta body weight: \(-3.2 \pm 3.0\) kg; delta BMI: \(-1.1 \pm 1.0\) kg/m\(^2\); Tibetan diet delta body weight: \(-6.2 \pm 4.4\) kg/m\(^2\); delta BMI: \(-2.1 \pm 1.5\) kg/m\(^2\); 12 months, usual care delta body weight: \(-2.7 \pm 3.1\) kg; delta BMI: \(-0.9 \pm 1.0\) kg/m\(^2\); Tibetan diet delta body weight: \(-6.3 \pm 4.9\) kg/m\(^2\); delta BMI: \(-2.2 \pm 1.7\) kg/m\(^2\); all, p < 0.001). After 6 and 12 months, the reduction in body weight and BMI was significantly more pronounced in Tibetan diet compared to usual care (all, p < 0.001; Table 3).

These results were paralleled by reductions in absolute values of body weight and BMI (usual care vs. Tibetan diet body weight at 6 months: 86.2 ± 11.4 kg vs. 83.6 ± 11.9 kg; p = 0.008; BMI at 6 months: 29.2 ± 3.6 kg/m\(^2\) vs. 28.5 ± 3.7 kg/m\(^2\); p = 0.024; body weight at 12 months: 86.5 ± 11.6 kg vs. 83.3 ± 11.7 kg; p = 0.002; BMI at 12 months: 29.3 ± 3.7 kg/m\(^2\) vs. 28.4 ± 3.6 kg/m\(^2\); p = 0.006) (Fig. 2A, B).

To test whether the primary endpoint is influenced by confounders, comparison of the decadic logarithm of body weight change (delta) between usual care and Tibetan diet was adjusted by possible confounders age, gender, six classical cardiovascular risk factors, laboratory markers, clinical parameters including systolic and diastolic blood pressure, heart rate, baseline body weight and BMI, IMT, LVEF, number of coronary vessels affected according to coronary angiography as well as medical treatment at the time of hospital admission (Table 2). Apart from hyperlipidemia (p = 0.008) and statin therapy (p = 0.003), multifactorial analysis of covariance revealed that delta body weight was independent of these potential confounders.

After 6 months of follow-up, the levels of total and LDL cholesterol, fibrinogen, and CRP were significantly decreased as compared to baseline levels in both groups (all, p < 0.01). These effects were significantly more pronounced in patients undergoing Tibetan diet as compared to patients undergoing usual care (total cholesterol: 176.2 ± 43.7 mg/dL vs. 185.1 ± 47.8 mg/dL; p = 0.024; LDL: 111.6 ± 37.8 mg/dL vs. 119.4 ± 40.9 mg/dL; p = 0.026; fibrinogen: 318.3 ± 90.4 mg/dL vs. 334.1 ± 87.9 mg/dL; p = 0.040; CRP: 1.2 ± 3.0 mg/dL vs. 2.2 ± 4.5 mg/dL; p = 0.036) (Fig. 2C-F). No such difference was detected for any of the other secondary endpoints including systolic and diastolic blood pressure, heart rate, HDL cholesterol, triglycerides, IMT, fasting glucose, or glycated hemoglobin (all, p > 0.1) (Table 3).

4. Discussion

This is the first study to compare dietary and behavioral advice according to recommended Western medicine diet (usual care) and Tibetan diet in a large cohort of patients with CAD and manifest metabolic syndrome. The major findings of the present study are: 1) both groups of patients with CAD and metabolic syndrome showed a significant reduction in body weight and BMI after 6 and 12 months, but these changes were more pronounced in patients following Tibetan diet as compared to usual care; and 2) after 6 months, levels of total and LDL cholesterol, fibrinogen, and CRP were significantly lower in patients following the principles of Tibetan diet as compared to usual care.

Principles of Tibetan dietary advice are based on human’s three-humor and “hot” (excess) and “cold” (deficiency) imbalance [15]. Such ideas are alien to and not easily reconciled with Western ideas of nutrition. It is encouraging to note that compared to interventional studies of low-fat and Mediterranean diets with a mean weight change of \(-4.5\) kg (both diets) after 6 months, \(-4\) kg (low-fat) and \(-5\) kg (Mediterranean) after 12 months [4], our Tibetan diet group showed a body weight change of \(-6.2\) kg after 6 months and \(-6.3\) kg after

Table 2

<table>
<thead>
<tr>
<th>Category</th>
<th>Factor</th>
<th>p value</th>
</tr>
</thead>
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<tr>
<td>Age</td>
<td>Years</td>
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<tr>
<td>Gender</td>
<td>Male vs. female</td>
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<tr>
<td></td>
<td>Hyperlipidemia</td>
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<td></td>
<td>Diabetes mellitus</td>
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<td></td>
<td>Family history of CAD</td>
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<td></td>
<td>Smoking</td>
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<td></td>
<td>Body mass index (&gt;25 kg/m²)</td>
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<td></td>
<td>Non-valvular atrial fibrillation</td>
<td>0.308</td>
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</table>

Table 3

<table>
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<tr>
<th>End points at 6 months follow-up</th>
<th>Usual care</th>
<th>Tibetan diet</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary endpoint (n = 501)</td>
<td>n = 246</td>
<td>n = 255</td>
<td></td>
</tr>
<tr>
<td>Loss of body weight (diet responder)</td>
<td>患者 - no. (%)</td>
<td>218 (88.6)</td>
<td>237 (92.9)</td>
</tr>
<tr>
<td></td>
<td>ΔBody weight – kg</td>
<td>-3.2 ± 3.0*</td>
<td>-6.2 ± 4.4*</td>
</tr>
<tr>
<td></td>
<td>ΔBody mass index – kg/m²</td>
<td>-1.1 ± 1.0*</td>
<td>-2.1 ± 1.5*</td>
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<tr>
<td>Secondary endpoints (n = 489)</td>
<td>n = 240</td>
<td>n = 249</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ΔSystolic blood pressure – mm Hg</td>
<td>-3.2 ± 14.9*</td>
<td>-4.3 ± 13.3*</td>
</tr>
<tr>
<td></td>
<td>ΔDiastolic blood pressure – mm Hg</td>
<td>-1.9 ± 9.6*</td>
<td>-1.8 ± 9.5*</td>
</tr>
<tr>
<td></td>
<td>ΔHeart rate – beats per minute</td>
<td>-3.2 ± 19.5*</td>
<td>-2.8 ± 14.8*</td>
</tr>
<tr>
<td></td>
<td>ΔCholesterol – mg/dL</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>-146 ± 60.9*</td>
<td>-22.5 ± 52.9*</td>
</tr>
<tr>
<td></td>
<td>LDL</td>
<td>-13.7 ± 56.8*</td>
<td>-21.6 ± 52.3*</td>
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<tr>
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<td>HDL</td>
<td>3.8 ± 16.2a</td>
<td>3.3 ± 16.4a</td>
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<td>ΔTriglycerides – mg/dL</td>
<td>-19.2 ± 62.1a</td>
<td>-23.3 ± 62.3a</td>
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<td>ΔIntima media thickness – mm</td>
<td>-0.1 ± 0.2*</td>
<td>-0.1 ± 0.1*</td>
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<td>ΔFasting glucose – mg/dL</td>
<td>-11.6 ± 24.0a</td>
<td>-11.8 ± 25.1a</td>
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<td>ΔGlycated hemoglobin – %</td>
<td>-0.1 ± 0.7*</td>
<td>-0.1 ± 0.6*</td>
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<tr>
<td></td>
<td>ΔFibrinogen – mg/dL</td>
<td>-40.8 ± 2.7</td>
<td>-57.8 ± 3.2</td>
</tr>
<tr>
<td></td>
<td>ΔC-reactive protein – mg/dL</td>
<td>105.7*</td>
<td>116.5*</td>
</tr>
<tr>
<td>Primary endpoint at 12 months</td>
<td>n = 243</td>
<td>n = 251</td>
<td></td>
</tr>
<tr>
<td>Loss of body weight (diet responder)</td>
<td>患者 - no. (%)</td>
<td>196 (80.7)</td>
<td>221 (88.1)</td>
</tr>
<tr>
<td></td>
<td>ΔBody weight – kg</td>
<td>-2.7 ± 3.1a</td>
<td>-6.3 ± 4.9a</td>
</tr>
<tr>
<td></td>
<td>ΔBody mass index – kg/m²</td>
<td>-0.9 ± 1.0a</td>
<td>-2.2 ± 1.7a</td>
</tr>
</tbody>
</table>

LDL denotes low-density lipoprotein, HDL high-density lipoprotein. * Mean ± standard deviation.

CAD denotes coronary artery disease, LDL low-density lipoprotein, HDL high-density lipoprotein, eGFR estimated glomerular filtration rate, LVEF left ventricular ejection fraction, ACE angiotensin converting enzyme.
12 months, respectively. Even more reassuring is the fact that positive effects on body weight were maintained after 12 months, although these values were obtained by telephone interview only, a factor that should be taken into account when looking at the data.

In accordance with Traditional Iranian Medicine and the Yin–Yang nature of fruits in TCM [16,17], Traditional Tibetan Medicine classifies food and dishes according to its “hot” or “cold” nature. Components of “hot” or “cold” food have shown to influence heart rate variability and nail fold microcirculation in healthy individuals [18]. Western diagnosis of CAD transferred to TCM or Traditional Tibetan Medicine respectively is a disease of “qi” or “rLung” (“wind”) property, and metabolic syndrome would be characterized as a disease of “Bad-kan” (“phlegm”) property [19]. As both “rLung” and “Bad-kan” are disorders of “cold” character, we designed a Tibetan dietary and behavioral program, which aimed to deliver “warmth” to the body both internally (food) and externally (behavior). Thus, the Tibetan dietary program, which was designed for subjects with a “cold” constitution, suggested preferable food with typically “hot” attribute such as ginger and

![Fig. 2. Body weight loss and decrease in body mass index (BMI) after 6 and 12 months. Both groups of patients (usual care and Tibetan diet) significantly lost (A) body weight and (B) BMI (usual care vs. Tibetan diet body weight at 6 months: 86.2 ± 11.4 kg vs. 83.6 ± 11.9 kg; p = 0.008; BMI at 6 months: 29.2 ± 3.6 kg/m² vs. 28.5 ± 3.7 kg/m²; p = 0.024; body weight at 12 months: 86.5 ± 11.6 kg vs. 83.3 ± 11.7 kg; p = 0.002; BMI at 12 months: 29.3 ± 3.7 kg/m² vs. 28.4 ± 3.6 kg/m²; p = 0.006). After 6 and 12 months, body weight loss and decrease in BMI were more pronounced in Tibetan diet compared to usual care (all, p < 0.001). (C–F) The 6-month follow-up levels of total and LDL cholesterols, fibrinogen and CRP were significantly decreased compared to baseline levels in both groups (all, p < 0.01), whereas levels of patients with Tibetan diet showed significantly more decreased compared to patients with usual care (Tibetan diet vs. usual care (total cholesterol): 176.2 mg/dL ± 43.7 vs. 185.1 mg/dL ± 47.8; p = 0.024; LDL: 111.6 mg/dL ± 37.8 vs. 119.4 mg/dL ± 40.9; p = 0.026; fibrinogen: 318.3 mg/dL ± 90.4 vs. 334.1 mg/dL ± 87.9; p = 0.040; CRP: 1.2 mg/dL ± 3.0 vs. 2.2 mg/dL ± 4.5; p = 0.036). Error bars represent 95% confidence intervals.
avoidable food with typically “cold” attribute such as coconut oil similar to previous description of Yin–Yang nature in TCM [18].

According to the current diet and lifestyle recommendations of Western medicine [8,9], body weight loss dietary programs in patients with CAD and metabolic syndrome should avoid fatty “red” meat, high-fat products and purine-rich food, which has been incorporated into usual care, whereas the Tibetan diet suggested low-carbohydrate, protein-rich food, which included “red” meat and purine-rich venison. Patients undergoing Tibetan diet had a significantly larger loss in body weight than patients with usual care after 6 and 12 months.

These results are in line with previous investigations on diet and lifestyle for preventing weight gain, which found that subjects with low-carbohydrate and protein-rich food intake had a higher weight reduction in contrast to subjects with low-fat products [4,20]. Thus, protein-rich diets may promote weight loss due to reduced appetite and energy intake [21], and higher protein consumption including purine-rich meat are not to be associated with hyperuricemia [22].

Moreover, Tibetan diet indicated lipid-modifying and anti-inflammatory effects, which may partly be explained by modified food intake containing a relatively higher proportion of polyphenols and antioxidant vitamins, potassium and calcium with beneficial effects on acute myocardial infarction risk [23].

Germany provides rather weak social gradients [24], and our study population comprised subjects from a region with a high socio-economic status and education, which is characterized by the lowest ischemic heart disease mortality in contrast to other German states and counties [11]. Thus, dietary and behavioral measures of the study were expected to be followed by the participants more reliably than comparable study cohorts of other regions of Germany. To support dietary program compliance and to test adherence, patients were repeatedly contacted through auxiliary healthcare providers, were encouraged to contact the nutritional medical doctor in charge for questions and problems, and additionally were motivated by a food-exercise diary preference [25].

Even though patients with a history of psychiatric disease were excluded, cognitive-personality characteristics of patients have not been tested by factor-based personality questionnaire or by psychological examinations, which is a limitation of the study as personality traits and psychological factors such as neuroticism and conscientiousness are associated with unhealthy eating patterns [26]. Thus, extraversion characterized by facets of warmth, gregariousness, assertiveness, activity, excitement-seeking, and positive emotions as well as the trait of optimism may reduce the incidence of ischemic heart disease and mortality [27]. Lifestyle/behavioral recommendations of the Tibetan diet were more pronounced to conduct a “warm”, active and gregarious life in order to better cope with adversity in healthier ways and to build stronger social relationships [28]. Thus, the Tibetan program sought for a “warm” and stable emotional status (extraversion) and eating behavior, as emotional distress and antioxidant vitamins, potassium and calcium with beneficial effects on acute myocardial infarction risk [23].

Another aspect should be taken into account that our study population comprised white Caucasians only. Racial/ethnic and genetic factors may influence the prevalence of diabetes mellitus type 2 and obesity, and it is unclear whether our findings can be implemented in other ethnic groups as well [29].

Our study was not designed to assess the prognostic value of Traditional Tibetan Medicine as a novel lifestyle diet. Thus, larger multicenter studies need to validate our findings of body weight loss and should also target the prognostic benefit, as previous studies of alternative medicine started with promising aspects in the pilot phase and subsequently revealed discouraging results in enhanced multicenter settings [30]. Moreover, principles of Tibetan diet should also be considered for other therapeutic applications in studies with Western medicine design to examine long-term effects on clinical outcome of cardiovascular diseases and disorders of “cold” property such as neurologic diseases or “hot” property such as gastrointestinal diseases.

In conclusion, nutritional and behavioral therapy according to a Tibetan protocol reduced body weight and BMI in patients with CAD and metabolic syndrome after 6 and 12 months significantly better than that of Western diet and may induce lipid-modifying and anti-inflammatory effects. Larger multicenter studies should substantiate the current findings.

Acknowledgments

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Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.ijcard.2013.07.034.

References

[14] Hovingh GK, Brownlie A, Writing Group of 3. updated accessory such as coconut oil similar to previous description of Yin–Yang nature in TCM [18].


