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Experiences with three different fiber supplements in weight reduction

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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Summary

Background: Fiber supplements added to a caloric diet have additional effects on weight reduction in overweight subjects. The aim of this study was to compare the effect of various commercial fiber supplements (glucomannan, guar gum and alginate) on weight reduction in healthy overweight subjects.

Material/Methods: One hundred and seventy six men and women were included to receive either active fiber substance or placebo in randomized placebo-controlled studies. The fiber supplements consisted of the viscous fibers glucomannan (Chrombalance®), glucomannan and guar gum (Appe-Trim®) and glucomannan, guar gum and alginat (Glucosahl).

Results: All fiber supplements plus a balanced 1200 kcal diet induced significantly weight reduction more than placebo and diet alone, during a five week observation period. However, there were no significant differences between the different fibers in their ability to induce weight reduction, which was approximately 0.8 kg/week (3.8±0.9, 4.4±2.0, 4.1±0.6 in the Chrombalance, Appe-Trim® and Glucosahl group, respectively).

Conclusions: Glucomannan induced body weight reduction in healthy overweight subjects, whereas the addition of guar gum and alginate did not seem to cause additional loss of weight.

key words: **alginate • glucomannan • guar gum**

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Background

Food rich in fiber has been associated with lower risk of cardiovascular disease and diabetes [1–7]. Most interest has been focused on the cholesterol lowering effect of fiber [2,8,9]. Fiber supplements have been shown to induce weight loss in short term studies [10–15], whereas there are only few long term studies with successful results [9,16]. A combination of a low caloric diet, a fiber supplement and mild exercise [17] appears to constitute a promising way for weight reduction.

The mechanisms for the weight lowering effects of fiber are not fully characterized. Previously these effects have been associated with soluble fiber and to lesser extent with insoluble fiber. A report on dietary fiber from the World Health Organization (WHO) recommends that these terms should be removed because these divisions are not useful analytically nor physiologically (Joint FAO) [18]. Therefore, fibers should be classified according to their ability of fermentation generating products that can affect metabolism and digestive absorption [19]. Moreover, the weight reduction effect of fiber have also been linked to the property of viscosity. The viscosity of dietary component is what is felt to be responsible for the slow absorption of the macronutrients [20] and increased satiety [21,22].

Numerous types of fiber supplements have been introduced during the last decade claiming special effects on weight reduction. In some reports the water-soluble and viscous fiber guar gum has been shown to reduce the body weight [10,11], whereas in a meta analysis [12] guar gum was not found to be effective to reduce the body weight. The water-soluble and highly viscous fiber glucomannan has been reported to reduce the body weight in some studies [14,15], but not in other studies [23–25]. Alginate is a viscous fiber that reduces cholesterol secretion and has been proposed as dietary fiber to reduce body weight [26], but this is not well documented [27].

So far there has been no comparative study of the effect of the different fiber supplements. The object of this study was therefore to compare the efficacy of three different viscous fiber supplements in various combinations, glucomannan, guar gum and alginate, in overweight subjects in a randomized double blind placebo-controlled design, without disclosing any significant differences between the dietary fibers used. The intention was to distinguish one type of fiber supplement from the other with regard to weight reduction.

Material and Methods

Otherwise healthy overweight subjects, age 30 till 60, (BMI>25.0 kg/m^2 and <30 kg/m^2, mean BMI=27.7kg/m^2) attending a primary care practice were invited to participate in the trial. Excluded were subjects with a history of gastrointestinal disease, type 1 diabetes and pregnancy. Subjects using diuretics, antacids, H_2 blockers, bulk laxatives, anorectics, and oral contraception started within a 6 months period before commencing treatment were also excluded. All subjects gave their informed consent. The studies were approved by the Local Ethical Committee and conducted according to the declaration of Helsinki and Venice. The trial was conducted as a randomized, double blind, parallel-group study of three different fiber supplements groups and three placebo groups. The studies were planned to last for 5 weeks each and the subjects were randomized for age, sex and BMI in each of the three fiber groups.

Table 1. Fiber supplement studies. Overview.

Product	Fiber type	Amounts/day (mg)
Glucosahl	Glucomannan Guar Alginat	4320 mg 900 mg 900 mg
Chrombalance®	Glucomannan	1240 mg
Appe-Trim®	Glucomannan Guar	420 mg 420 mg

The content of the three different fiber supplements, Glucosahl, Chrombalance and Appe-Trim is shown in Table 1. The diet consisted of 1200 kcal/day (5000 kJ/day) divided into 35% fat, 15% protein and 55% carbohydrates. The adherence to the treatment and the diet was evaluated each weekly visit during the treatment period using a standardized questionnaire. Fiber tablets or placebo tablets with identical taste and look were given to the participants at start and at each weekly visit. The dosage was 6 tablets taken 3 times daily with 250ml of water 15 minutes before meals and 4 tablets taken at 3 PM. In addition, each subject received one multivitamin tablet per day. For most vitamins and minerals, the content was equal to 100% of Recommended Daily Allowance (RDA). In order to keep the subjects motivated they were informed in groups about health consequences of overweight at each weekly visit during the treatment period. The subjects were free to ask any questions that might occur.

All participants underwent a medical examination before inclusion. Blood pressure in supine position after 5 minutes of rest, as well as heart rate (bpm), body weight (kg), BMI (body weight in kilogram divided by square of height in meters) were recorded. Each study continued for 5 weeks, with visits to the clinic scheduled at the same time each week. Subjects were weighed weekly. Compliance with drug treatment was checked by returned dose packets; 80% compliance was considered acceptable.

Statistical methods

All results are given as mean ±SD. In the analyses of differences, one-tailed test was used. Differences were considered statistically significant if the p-value was less than or equal to a level of 5%. To test differences between groups, Wilcoxon rank sum test was applied. To test differences of paired variables within the groups, Wilcoxon signed rank sum test or Students t-test was used, depending on whether the distribution pattern appeared to be non-parametric or parametric.

The intention to treat principle was applied. Patients who discontinued the trial for reasons not related to the treatment regimen were designed as “drop-outs”, while those who discontinued for reasons related to the treatment, were defined as “withdrawals”. For “drop-outs” the last weight before ter-

Table 2. Anthropometric data in Glucosahl study.

	Placebo	Glucosahl
Number of subjects	28	25
Age (mean ±SD)	38.5±5.1	37.9±4.8
Range in age	19–60	20–58
Start weight (kg) (mean ±SD)	82.7±3.7	86.0±4.5

Table 3. Anthropometric data in the Chrombalance® study.

	Placebo	Chrombalance®
Number of subjects	29	23
Age (mean ±SD)	40.1±5.6	39.7±4.0
Range in age	19–57	21–60
Start weight (kg) (mean ±SD)	76.8±3.9	79.0±5.4

mination was recorded, whereas the highest weight observed during treatment was recorded for "withdrawals".

Results

Glucosahl

In the Glucosahl study 60 healthy overweight (BMI>25 kg/m^2 <30 kg/m^2) women were included. There were 5 subjects in the active group and 2 subjects in the placebo group that did not fulfill the inclusion criteria at Day 1 as they had lost weight since the randomized period. Therefore, 53 moderately overweight women fulfilled the inclusion criteria. All the women followed the study according to the study protocol and were included in the analysis. The study medication was well tolerated. The active and the placebo groups did not differ significantly with regard to the background variables as shown in Tables 2–5.

Chrombalance

In the Chrombalance study 60 healthy women with mild to moderate overweight were intended to be included. There were 7 subjects in the active group and 1 subject in the placebo group that did not fulfill the inclusion criteria at Day 1 as they had lost weight since randomizing period. All the women followed the study according to the study protocol and were included in the analysis. The study medication was well tolerated. There were no differences between the other background variables (Table 3). All subjects followed the protocol and were included in the analysis.

Appe-Trim

In the Appe-Trim study 60 healthy overweight subjects were included, 30 in each of the Appe-trim group and placebo group. All the subjects followed the study according to the study protocol and were included in the analysis. The study medication was well tolerated. The active and the placebo groups did not differ significantly with regard to the background variables (Table 4).

Table 4. Anthropometric data in Appe-Trim study.

	Placebo	Appe-Trim
Number of subjects	30	30
Age (mean ±SD)	35.4±4.0	38.7±4.1
Range in age	19–57	21–60
Start weight (kg) (mean ±SD)	79.4±3.6	82.7±4.9

Table 5. Changes in body weight during treatment with different fiber supplements.

Type of fiber supplement	Weight reduction (kg) Active	Weight reduction (kg) Placebo	Statistical significance
Glucosahl	4.4±2.0	2.7±1.3	P<0.001
Chrombalance®	3.8±0.9	2.5±0.5	P<0.01
Appe-Trim®	4.1±0.6	2.1±0.5	P<0.01

Weight reduction

In table 5 the changes in the body weight during the various fiber supplements are shown. Compared to placebo there were significant weight losses in all the three different fiber groups. However, there were no significant changes between the three different fiber supplements or between the three different placebo groups.

Discussion

The present results support previous findings that fiber supplements combined with energy intake restriction have additional effects on weight reduction. During the observation time, the weight reduction attained was approximately 3 kg per month. This is what is expected as an initial effect of fiber supplements in combination with a restricted caloric diet of 1200 kcal. This is a consistent finding in other short-term studies as well [28,29].

The main objective of the present study was to compare the weight reducing effect of various fiber supplements in overweight subjects. The fiber supplements used were glucomannan, guar and alginat which are commonly used in various combinations. Glucomannan was a constituent in all fiber combinations. When used alone, (Chrombalance) there was a modest, but significant weight reduction compared to the control group. This agrees with some previous reports [14,15,23–25]. Moreover, our study shows that among

three commercial products, Glucosahl, Chrombalance® and Appe-Trim®, there were no significant differences in their ability to induce weight reduction in overweight subjects. Another interesting observation was the comparisons of various fiber content in Appe-Trim and Glucosahl. When increasing the daily content of glucomannan from 420 mg to 4320 mg and guar from 420 mg to 900 mg there were no significant differences in the weight reduction (2.0 kg versus 1.7 kg). This indicates that increasing the fiber content of glucomannan and guar gum in the supplement had no significant effects on weight reduction. Therefore, our study indicates that using glucomannan as a single fiber supplement induced modest weight reduction, and combined with guar and alginate it did not give additional effects on weight reduction in the short term. What the lowest optimal dose of glucomannan would be in order to give the most weight reducing effect, is unknown and was beyond the scope of this study. According to our study, the daily dose of glucomannan as a single fiber supplement should be at least 1240 mg. Moreover, whether there would be differences between the effects of the three fiber supplements in the long term, are unknown. However, weight reduction induced by fiber supplements is usually strongest initially, and attenuates throughout an observation time of approximately 6 months [3]. Thus, it is unlikely that the three different fiber supplements used, have significantly different quantitative weight reducing effects, even in the long term. But this awaits further studies.

CONCLUSIONS

Fiber supplements in addition to a diet restriction elicits additional effects on weight reduction. However, there appears to be no apparent differences among various fiber supplements in their ability to induce weight loss in short term studies.

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