An Analysis of Dietary Fiber Intensive Intervention Effect in Metabolic Syndrome

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Abstract:
Objective: To study the intensive intervention effect of dietary fiber intake on female patients with metabolic syndrome under exercise and diet therapy. Methods: Sixty-seven female patients with non-drug-treated metabolic syndrome were selected. All subjects were urban light physical workers. The control group received exercise and diet intervention. The experimental group was given 30 g/d dietary fiber intensive intervention for 4 months on the basis of exercise and diet. The clinical effects of the two groups were observed and compared. Results: The decrease of body mass index, waist-to-hip ratio, total cholesterol, low-density lipoprotein cholesterol, postprandial blood glucose and visceral fat index in the experimental group were significantly higher than those in the control group (P < 0.05). Conclusion: Dietary fiber therapy can improve the body composition, blood glucose and blood lipid of the patients on the basis of diet and exercise therapy.

keywords: Metabolic syndrome; Dietary fiber; Intervention effect

Metabolic syndrome (MS) is a serious clinical manifestation that results from obesity and insulin resistance (IR) is expressed as the core. The metabolic syndrome (MS) is. MS prevalence increased year by year, and has become a hot topic of concern at home and abroad. In this study, 67 cases of female MS patients received dietary fiber intensive intervention to provide a basis for the clinical application of dietary fiber.

1 Objects and methods
1.1 Intervention
On the voluntary principle, 67 cases of 18 to 60-year-old female MS patients in the Second People’s Hospital of Taiyuan City are selected, and all of them are urban light physical workers. Inclusion criteria: in line with the International Diabetes Federation 2005 MS definition: central obesity (abdominal circumference) as the diagnosis of preconditions, having more than 2 of the following: ① obesity diagnosis: waist > 80 cm; ② triglyceride (TG) ≥ 1.7 mmol/L; ③ high density lipoprotein cholesterol (HDL-C) < 1.3 mmol/L; ④ Blood pressure: systolic blood pressure (SBP) ≥ 130 mm Hg or diastolic blood pressure (DBP) ≥ 85 mm Hg; ⑤ abnormal glucose metabolism: fasting blood glucose (FPG) ≥ 5.6 mmol/L.

We randomly divide dietary fiber intervention group (intervention group) and control group, intervention group (34 cases) and control group (33 cases). The age of the intervention group was between 23 and 59 years old (mean, 47 ± 11 years). The age of the control group was between 30 and 60 years old (mean, 49 ± 9 years). There was no significant statistical difference in age structure and in the physiological and biochemical indexes before intervention between the two groups.

1.2 Intervention measures
1.2.1 Exercise Intervention: All subjects wear the Omron MBB-HJ-108 pedometer with a daily exercise of less than 12,000 steps.
1.2.2 Diet intervention: preparing for individual dietary recipes, based on the subject metabolism, with or without complications, with reference to the Chinese adult female

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dietary energy requirements (EER) recommended value, the average energy, nutrient intake and capacity of nutrients for energy ratio per person per day was analyzed using food exchange to prepare individual dietary recipes. Nutritional physician provide theoretical knowledge and practical experience guidance for the subjects in individualized recipes, food mix and cooking, and the application of food exchange table.

1.2.3 Dietary fiber intervention: to give the intervention group 30 g / d dietary fiber, divided into two times before meals.

1.3 Experimental materials
The dietary fiber used in the test was provided by Shanxi Maifu Food Fiber Co., Ltd., 30.0 g of total dietary fiber, 28.3 g of protein, 9.4 g of fat, 24.7 g of carbohydrate, sodium < 0.015μg and 422.82 μg of calcium.

1.4 Detection indicators
1.4.1 the test of biochemical indicators: all subjects are required 12h fasting, in the next morning take the elbow vein blood, determine blood sugar, blood lipids, and insulin levels. Blood was collected respectively before and after intervention.

1.4.2 Analysis of human body composition: Body composition analysis was made using BCA-2A bioelectrical impedance of human body composition tester produced by Tsinghua Tongfang Health Technology Co., Ltd. to test the subjects, including the waist-to-hip ratio and visceral fat index, and the detection process strictly follow the instrument instructions.

1.5 statistical processing
The database was established by Excel software, and SPSS 13.0 software was used for statistical analysis. Measurement data with t test, P <0.05 for the difference was statistically significant.

2 results
2.1 Basic situation of energy intake: All subjects had basal metabolism (1 297 ± 142 kcal, energy intake before the test (1936 ± 180) kcal, energy intake during the test (1 478 ± 151) kcal. The average energy intake during the test decreased by 23.7%, having no adverse reactions and hunger.

2.2 Comparison of biochemical indicators before and after intervention: before the intervention there was not statistically significant (P> 0.05) in body composition analysis and biochemical indicators of the two groups. But for dietary fiber intervention group, there was statistically significant.

<table>
<thead>
<tr>
<th>Group</th>
<th>Case</th>
<th>Before the intervention</th>
<th>After the intervention</th>
<th>Before the intervention</th>
<th>After the intervention</th>
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<th>After the intervention</th>
<th>Before the intervention</th>
<th>After the intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>33</td>
<td>29.2±3.5</td>
<td>28.2±3.6</td>
<td>0.98±0.06</td>
<td>0.96±0.06</td>
<td>12.3±0.8</td>
<td>12.1±0.8</td>
<td>5.1±1.0</td>
<td>5.0±1.2</td>
<td>1.9±0.8</td>
<td>1.5±0.6</td>
</tr>
<tr>
<td>Intervention group</td>
<td>34</td>
<td>29.0±3.3</td>
<td>26.3±3.5</td>
<td>0.93±0.06</td>
<td>0.93±0.06</td>
<td>11.7±0.8</td>
<td>11.7±0.8</td>
<td>4.3±0.9</td>
<td>4.3±0.9</td>
<td>1.4±0.6</td>
<td>1.3±0.27</td>
</tr>
</tbody>
</table>

Note: a compared with the control group after intervention P <0.05; b compared with that before intervention P<0.05
significant in the body mass index (BMI), waist-to-hip ratio, visceral fat index, total cholesterol (TC), TG, HDL-C, low density lipoprotein cholesterol (LDL-C), FPG, postprandial blood glucose and fasting Insulin and insulin resistance index (P <0.05) before and after intervention. By comparison, the TG and FPG values of the control group were significantly lower than those before the intervention (P <0.05), which is statistically significant. There was no statistically significant difference in the other indexes. After 4 months intervention, the BMI, waist-to-hip ratio, TC, LDL-C, postprandial blood glucose and visceral fat index of the intervention group were significantly improved compared with the control group, and the difference is statistically significant (P <0.05). TG, HDL-C, FPG were not statistically significant compared with that of the control group.

3 Discussion

MS is the result of the interaction between genetic and environmental factors. Insulin resistance and obesity are the core and source of MS, respectively. MS not only has great harm on the body’s normal physiological function, but also is the risk factors of cardiovascular disease[2]. At present, the incidence of MS among over 20 years old adult in China’s urban community is up to 15%, 40% of over 60 years age population, having more than 200 million patients[3] the city is higher than rural areas, women higher than men[4].

In recent years, dietary fiber is drawing increasingly attention in the field of nutrition and medicine, its role is not limited to weight loss, is also beneficial to MS[5]. Epidemiological survey showed that dietary fiber is a protective factor of MS[6]. A study of overweight and obese women showed that >35g/d dietary fiber intake significantly reduced body fat, waist circumference, lower blood pressure, FPG, TC, TG and LDL-C low density lipoprotein cholesterol and increased insulin sensitivity[7]. This study also shows that dietary fiber intensive intervention is superior to diet, exercise intervention. Study of Deremaux et al[8] also shows that dietary fiber can effectively improve body composition, and reduce body weight of the metabolic syndrome patients. Dietary fiber has a significant effect in reducing postprandial blood glucose, which may be related to its delayed gastric emptying[9]. Dietary fiber can improve blood lipids, and animal experiments have also proved that complex dietary fiber can improve blood lipid disorders[10].

Studies by Giacco et al[11] have shown that cereal dietary fiber can help reduce postprandial insulin levels. This study, due to the limited sample size and fluctuated postprandial insulin levels and the large individual differences, failed to prove the difference between the two groups was statistically significant, but insulin levels decreased and insulin resistance improved significantly. In this study, after 4 months of diet, exercise intervention, compared with those before the test, only TG and FPG were significantly reduced, the difference was statistically significant. And Bai Youping et al[12] study of college students, 8 weeks exercise intervention can effectively improve the body weight, body mass index, to achieve better weight loss, and FPG significantly reduced. The results may be related to the relatively older average age of the subjects in this study.

References

[8] Deremaux LG, Li Shuguang, Pochat M et al. Effects of NUTRIOSE1 dietary fiber supplements on energy intake and


