A study on the effects of green tea intake on blood glucose in Shizuoka, Japan.

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Summary

The aim of this study is to evaluate the effects of green tea intake on blood glucose and blood pressure, et al. We examined 24 male workers in a town, aged 40–59 in October or November, 2000. Most of them had fasting blood glucose above 110 mg/dl and all of them with no treatment.

We asked them to take the green tea powder that contains 150 mg of polyphenol, three times a day for two months. We compared the study results before and after the green tea intake. The change on findings of laboratory tests and others were as follows: blood glucose,116.6→112.5mg/dl; HbA_{1C},5.6→5.4%; body fat percentage 23.6→22.2%; SBP,138.7→129.7mmHg; T-chol,228.4→216.0mg/dl. Using paired t-test, significant differences were found in SBP, body fat percentage, T-chol.

The percentages of the examinees who showed lower level for each finding after the two months were as follows: 62.5% in blood glucose; 37.5% in HbA_{1C}; 83.3% in body fat percentage; 75.0% in SBP; 87.5% in T-chol, respectively. The relationships of catechin intake to blood chemical findings, blood pressure, nutrients intake, and alcoholic beverages were also evaluated.

Key words

Green tea intake, polyphenol amount, middle aged man, prevention, diabetes mellitus.

Introduction and Objective

Diabetes is a risk factor for cerebro-cardiovascular diseases and it causes complications such as kindey diseases. It has been noted that the cases of diabetes increase with age in Japan.

Therefore, prevention of diabetes is of a great significance in the iifestyle-related diseases. Various research has been conducted in regard to guidance of diet and exercises for diabetes patients, however, there are still few studies on relationship between food composition or food item and diabetes mellitus. The aim of this study is to evaluate the effects of green tea intake for those with high blood glucose.

Subjects and Methods

Subjects : We examined 21 male workers, aged 40-59 in town A, Shizuoka Prefecture. Many of them had fasting blood glucose above 110mg/dl at the time of basic physical examination from autumn to winter in the year 2000. None of them were on medication.

Methods :

1. In order to make green tea intake more convenient, we used green tea powder made from green tea extract especially for this research. We asked the participants to

take green tea powder containing 150 mg of polyphenol, three times a day for the two-month.

2. In April, we conducted physical examination, blood chemical analysis, nutrition survey, questionnaire on eating habit and lifestyle, green tea intake as well as the concentration of green tea the subjects usually drank. The amount of green tea intake was measured by asking the subjects how many cups of green tea they drank per day. The amount of polyphenol intake was calculated by considering the green tea concentration and the amount of green tea intake.

3. The second survey was conducted to observe the changes in the physical and blood chemical values in June.

4. The third survey was conducted two months after the subjects stopped drinking green tea made from powdered green tea.

5. Survey period :

First Survey : From the end of March to the beginning of April, 2001 (4days)
Second Survey : Early June, 2001 (3days)
Third Survey : Early August, 2001 (3days)

To estimate the concentration of green tea that they usually drink, we asked them to put the green tea leaves in the cup and leaves them for one minute after pouring hot water of 85 ℃. We prepared three types: 1%, 2%, 3% concentration tea, using the same kind of green tea. They drank them and compared the concentration of the three types.

Results

(1) First survey (before intake of green tea powder)

Table 1 shows means of physical, blood chemical values.

Table 1 Means of medical examination findings (before green tea powder intake)

Age : 40-59
Subjects : 21males

		Mean ± SD
Systolic Blood Pressure	(mmHg)	138.9 ± 21.5
Diastolic Blood Pressure	(mmHg)	85.4 ± 13.5
Body fat percentage	(%)	23.4 ± 5.5
BMI		24.3 ± 3.9
Hemoglobin	(g/dl)	15.4 ± 0.8
GOT	(IU/l)	28 ± 14
GPT	(IU/l)	34 ± 26
γ-GTP	(IU/l)	67 ± 47
Serum total cholesterol	(mg/dl)	229.4 ± 29.7
Blood glucose	(mg/dl)	107.7 ± 19.6
HbA_{1c}	(%)	5.1 ± 0.8

Amount of daily green tea intake was 452±425ml. The subjects who usually drank green tea of 2% concentration accounted for 57%, and 38% of them drank green tea stronger 3% concentration.

(2) Amount of polyphenol intake

At the 1st survey, the amount of polyphenol intake was 480±494mg, and it was 1,008±625mg during the period of green tea powder intake. At the 3rd survey, it amounted to 369±286mg.

(3) The changes of the findings

Changes in the findings of physical examinations of the 1st, 2nd and 3rd surveys were shown in Fig.1, comparing the findings in the 2nd survey with those in the 1st survey, and the findings in the 3rd survey with those in the 2nd survey.

As for blood glucose, it declined by 2.8mg/dl in the 2nd survey but it rose by 0.9mg/dl in the 3rd survey.

HbA_{1c} declined by 0.1% in the 2nd survey and rose by 0.1% [significant difference ($p<0.01$)] in the 3rd survey.

Total serum cholesterol declined by 11.6mg/dl [significant difference ($p<0.01$)] in the 2nd survey and rose by 2.5mg/dl in the 3rd survey.

As for systolic blood pressure, it declined by 9.5mmHg [significant difference ($p<0.01$)] in the 2nd survey and by 3.0mmHg in the 3rd survey.

Diastolic blood pressure declined by 1.4mmHg in the 2nd survey and it also declined by 1.9mmHg in the 3rd survey.

Body fat percentage declined by 1.4% [significant difference ($p<0.001$)] in the 2nd survey and 0.8% [significant difference ($p<0.05$)] in the 3rd survey.

As for body mass index (BMI), it declined by 0.1($p<0.001$) in the 2nd survey, however, no change was observed in the 3rd survey.

Fig.1 Changes in physical,blood chemical values before and after green tea powder intake

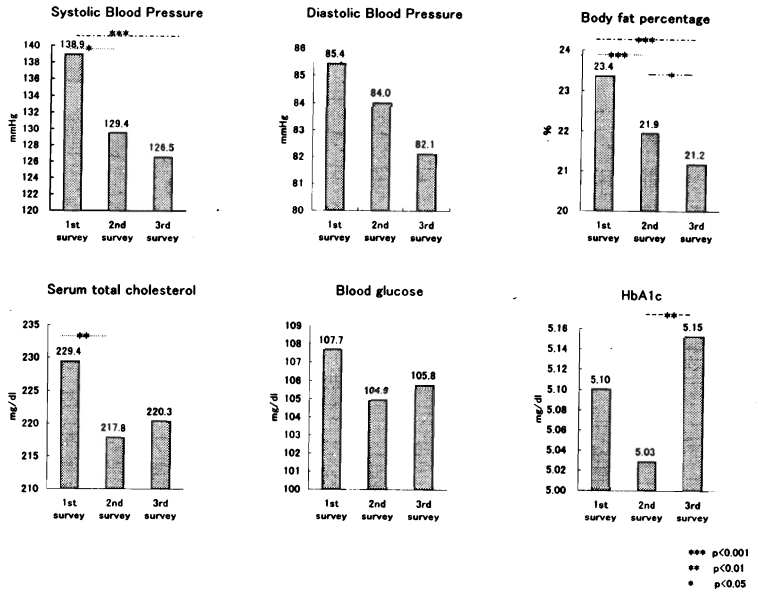
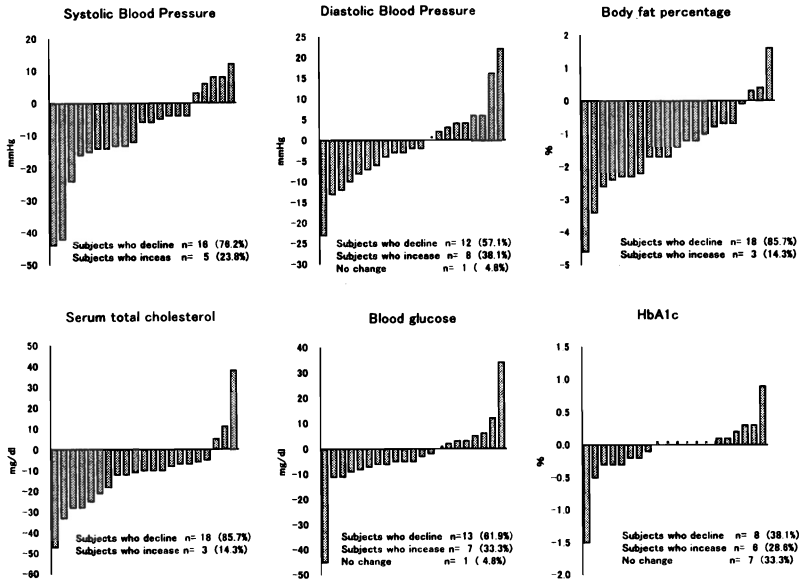


Fig.2 shows changes in physical, blood chemical values of individual subjects before and after green tea powder intake. These figures show changes in physical and blood values of individual subjects after green tea powder intake.

Subjects were classified into two groups, that is, those who showed increase and those who showed decrease for each finding.

The percentages of the subjects who showed decline were as follows: 61.9% in blood glucose; 38.1% in HbA_{1c}; 85.7% in total serum cholesterol; 76.2% in systolic blood pressure; 57.1% in diastolic blood pressure; 85.7% in BMI.

Fig.2 Changes in physical,blood chemical values before and after green tea powder intake (2nd-1st)



〔Definition〕
Group A : fasting blood glucose < 110mg/dl
Group B : fasting blood glucose ≧ 110mg/dl

Changes in blood glucose and HbA_{1c} from the 1st survey to the 2nd survey were observed. There were 16 subjects (76%) in Group A and 5 subjects (24%) in Group B.

As for blood glucose, 8 subjects (50%) in Group A showed 6.6mg/dl decline on average and 7 subjects (43.7%) showed 9.3mg/dl increase on average.

As for HbA_{1c}, 4 subjects (25.0%) in Group A showed 0.2% decline on average and 6 subjects (37.5%) showed 0.3% increase on average.

In Group B 4 subjects (80%) showed 0.7% decline on average.

All subjects in Group B showed 0.7% decline both in blood glucose and HbA_{1c}.

Conclusion

1. This study was conducted on the male subjects, aged 40-59, to examine the effects of green tea powder intake on blood glucose and other values.

2. After the green tea powder intake, some improvements have been observed in blood glucose, blood pressure, serum total cholesterol and body fat percentage. Also many of the participants with abnormality in blood glucose showed abnormality in their blood pressure, serum total cholesterol, body fat percentage, etc.

3. However, correlation analysis showed statistically no significant differences between the amount of polyphenol and the changes in blood glucose, HbA_{1c}, serum total cholesterol, etc. This may be due to the fact that 1) the participants were not limited to those with abnormality in blood glucose and others; 2) the amount of polyphenol intake during the green tea powder intake may be related to polyphenol intake before the survey; 3) there might have been changes in the diet and/or in the amount of exercises, etc. For further analysis, we plan to take these factors into consideration.