Effect of Stevia Extract Intervention on Lipid Profile

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ABSTRACT *Stevia rebaudiana* is a natural herbal low calorie sweetener of the asteraceae family. The study was conducted to determine the effect of consumption of stevia extract on selected 20 hypercholesterolemic women. The preparation of stevia extract was standardized in the laboratory, 20 ml of extract was used to intervene one subject in a glass of water (200ml). The results revealed that the consumption of stevia extract reduced the levels of cholesterol, triglyceride, LDL-C significantly while an increased in HDL-C was noted which is desirable. Thus it is concluded that stevia extract have hypolipidaemic effect and can be used to reduce the risk of CVD in future.

INTRODUCTION

Good health is a major resource and an important dimension of the quality of life. In present times, changes in lifestyle and dietary pattern stemming from rapid modernization have favoured an increase in the occurrence of non-communicable yet chronic and degenerative diet related diseases among which cardiovascular diseases occupy a primary place. Throughout the twenty first century the health science focused primarily on curing diseases with powerful drugs, more sophisticated diagnostic tests and more effective therapies. Today the emphasis is on health expectancy rather than the life expectancy. Synthetic drugs may show serious side effects on health. Therefore attention has been directed to use the ayurvedic system of medicine without any side effects. *Stevia rebaudiana* is a sweet herbaceous plant and its leaf extract has been used traditionally in the treatment of diabetes. The documented properties of stevia are anti-bacterial, anti-fungal, anti-inflammatory, anti-microbial, anti-viral, anti-yeast, cardiotonic, diuretic, hypoglycemic and vasodilator.

The objective of the study was to prepare stevia extract and to find out the effect of stevia extract intervention on lipid profile, so that diabetics can make use of it as a sweetener along with reducing the risk of hypertension and cardiac disease in future.

MATERIAL AND METHODS

(A) Sample Selection: The study was conducted in municipal limits of Udaipur city, Rajasthan. The criteria used for sample selection were:

(i) Women in the age group of 40-60 years.
(ii) Women not suffering from any chronic disease.
(iii) Women with body mass index > 25
(iv) Women having blood cholesterol > 200 mg/dl
(v) Women not consuming hypercholesterolemia drugs and willing to participate.

A survey was done to select the sample for the study using snow ball sampling method. Initially, 50 women were contacted and brief about the purpose of the study. Their general background, anthropometry (height, weight and BMI), and serum cholesterol were assessed. Out of 50 women, 20 women having cholesterol level > 200 mg/dl and fulfilling the inclusion criteria were selected for intervention.

(b) Stevia Extract Preparation: The preparation of stevia extract was standardized in the laboratory. Through sensory evaluation, it was found that considering the sweetness, 20 ml of extract was convenient to intervene one subject in a glass of water (200 ml). To prepare 20 ml of extract, 3.3 g of stevia leaf powder was boiled with 70 ml of water and continued till it reduced to 20 ml.

(c) Stevia Extract Intervention: Extract was prepared in the large amount sufficient to intervene the subjects. For this purpose, 66 g of stevia leaf powder was boiled with 1500 ml water for 3 hours and 20 minute which produced 400 ml of extract. The investigator prepared the extract fresh in the early morning every day and distributed to the subjects personally. The subjects were asked to consume the extract in the presence of investigator for a period of one month.

(d) Effect of Intervention on Lipid Profile:
The biochemical parameters like serum cholesterol, triglyceride, high density lipoprotein, low density lipoprotein and very low density lipoprotein were estimated before and after the intervention of stevia extract.

RESULTS AND DISCUSSION

The Table 1 presents the information gathered about fifty respondents. It shows that (88%) respondents belonged to the age group of 40-50 years while rest (12%) were in the age group of 50-60 years. Information on religion of the subjects shows that (92%) were Hindu while (8%) were Muslim. On the basis of educational level 32 percent respondents were graduates. Nearly 42 percent subjects were educated upto higher secondary level and 26 percent subjects possessed post graduation degree. Observation based on the food habits indicate that 52 percent of the respondents were vegetarian while non-vegetarian and ovo-vegetarian constituted 36 and 12 percent, respectively.

The subjects were belonging to middle income group, income ranging from Rs. 10,000-20,000 per month. Majority the heads of family were engaged in service (82 percent), while rest (18 percent) were business man. Out of the total subjects 72 percent were housewives and 28 percent were engaged in service.

The Table 2 shows the body mass index of the subjects that 44 percent were in normal category with BMI ranging from 20-25 kg/m^2 and 38 percent were between 25-30 kg/m^2 i.e. obese grade I category while 18 percent subjects had BMI > 30 kg/m^2 and categorized as obese grade II as per the classification given by James et al. (1988).

The cut off values for the lipid fractions and the risk of CVD among the subjects has been presented in the table 3. Fifty percent subjects had borderline risk with regard to cholesterol while remaining 50 percent subjects were in the high risk group. Triglyceride level of 85 percent subjects was in the range of 150-250 mg/dl indicating borderline risk of CVD while 15 percent were at high risk having > 250 mg/dl.

Table 1: General information of the respondents

Information	Percentage (n=50)
Age	
40-50 years	88
50-60 years	12
Religion	
Hindu	92
Muslim	8
Sikh	-
Christian	-
Education	
Higher secondary	42
Graduation	32
Post graduation	26
Food Habits	
Vegetarian	52
Non-vegetarian	36
Ovo-vegetarian	12

Table 2: Percentage distribution of subjects on the basis of BMI

BMI range (kg/m^2)	Interpretation	Percentage of subject (n=50)
20 - 25	Normal	44
25 - 30	Obese grade I	38
> 30	Obese grade II	18

High density lipoprotein cholesterol level between 35-50 mg/dl, while only 30 percent and 10 percent subjects were in the desirable and high risk group respectively. Very low density lipoprotein cholesterol levels of the subjects indicate that 50 percent subjects were at high risk while 45 percent were at the borderline risk. Desirable very low density cholesterol levels were

Table 3: Percentage distribution of subjects on the basis of prevalence of dyslipidemia

Lipid fraction	Desirable					Borderline					High risk				
	TC	TG	HDL	LDL	VLDL	TC	TG	HDL	LDL	VLDL	TC	TG	HDL	LDL	VLDL
Cut off values	<200	<150	>50	<130	<30	200-240	150-250	-	130-160	31-40	≥240	>250	<35	>160	> 40
% of subjects	0	0	30	50	5	50	85	-	45	45	50	15	10	5	50

Note: Remaining 60% subjects had HDL levels between 35-50 mg/dl
Classification given by NCEP AT P III, 2001.
TG = Triglyceride
TC = Total Cholesterol
LDL = Low Density Lipoprotein
HDL = High Density Lipoprotein
VLDL = Very Low Density Lipoprotein

Table 4: Effect of stevia extract intervention on lipid profile

Lipid fraction (mg/dl)	Mean ± SD		t value
	Pre-intervention(n = 20)	Post intervention(n = 20)	
Serum cholesterol	240.5 ±25.01	229.55 ±23.65	6.94**
Triglyceride	207.2 ±35.2	194.8 ±31.30	10.76**
High density lipoprotein	47.9 ± 9.26	49.75 ± 9.23	4.63**
Low density lipoprotein	129.72 ±17.48	125.04 ±18.74	5.96**
Very low density lipoprotein	41.43 ± 7.03	38.96 ± 6.26	2.47[NS]

** Significant at 1% level
NS = Non-significant

found only in 5 percent subjects. Low density lipoprotein cholesterol level of the subjects indicate that 50 percent were in the desirable range, 45 percent were at the borderline risk. Desirable limit of very low density cholesterol was found only in 5 percent subjects. While low density lipoprotein cholesterol level of the subjects indicate that 50 percent were in the desirable range, 45 percent were at the borderline risk and rest 5 percent were in the high risk group. These results indicates that the lipid fractions viz., serum total cholesterol, triglyceride, low density lipoprotein cholesterol and very low density lipoprotein cholesterol were higher than the desirable limits thus putting the subjects at a risk of CVD.

The Table 4 presents data pertaining to different fractions of lipid profile prior to and after the intervention study.

Serum Cholesterol and Triglyceride: Stevia extract intervention had a definite positive effect on the cholesterol levels of the subjects. The intake helped to reduce the mean serum cholesterol from 240.5 mg/dl to 229.55 mg/dl within one month period. The results were found to be statistically significant (p< 0.01) and the mean value after intervention was 229.55 ± 23.65 mg/dl. There was a significant decrease in the mean values of serum triglyceride prior to and after the intervention period. The mean value decreased from 207.2 mg/dl to 194.8 mg/dl indicating a good reduction. The triglyceride levels were in the high risk range at the inception of the study and declined to the range of borderline risk of C V D with serum triglyceride level of 150 – 250 mg/dl. Thomson et al. (2006) reported that there was a signification reduction in cholesterol levels (11-14%), triglyceride levels (38%) of rats, when rats were treated with a low dose (50mg/Kg) of raw aqueous extract of garlic.

HDL-C, LDL-C, VLDL-C: HDL-C level in-

creased from 47.9 mg/dl to 49.75 mg/dl after intervention which was statistically significant (p < 0.01). The increase in HDL-C is helpful in reducing the risk of CVD. As HDL transports free cholesterol from the tissues to the liver for catabolism and excretion (Khanna, 1999). The intervention with stevia extract resulted in a reduced level of LDL-C from 129.7 mg/dl to 125.04 mg/dl. Erba et al. (2004) reported a significant decrease in LDL-C on consumption of extract of (two cups) green tea, containing approximately 250 mg of total catechins. The VLDL-C levels were lowered from 41.43 mg/dl to 38.96 mg/dl and the reduction was not found to be statistically significant (p < 0.01). Bhattacharya and Bhattacharya (1994) examined the effect of psyllium husk (Naturolax) 7 gram daily, among hyperlipidaemic subjects, resulted in a significant decrease in serum cholesterol, triglyceride, LDL-C, VLDL-C with an increase in HDL-cholesterol levels.s

CONCLUSION

Results of intervention revealed that stevia extract intervention had positive and encouraging effects over lipid profile. No adverse effect was observed on the health status of the subjects and it can thus be concluded that the stevia extract intervention is effective in lowering the elevated levels of serum cholesterol, triglyceride, low density lipoprotein and very low density lipoprotein levels and increasing the HDL levels.

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