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Effectiveness of *Cinnamomum zeylanicum* tea on anthropometric indices

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Abstract
Cinnamon has been touted for its therapeutic benefits from antique times. An array of phytochemicals makes cinnamon a promising functional food for weight reduction. The study was conducted among sixty diabetes subjects. Subjects were supplemented with 75 ml of cinnamon tea for 45 days. Anthropometric indices like height, weight, body mass index, waist circumference, percent body fat were assessed before and after supplementation. Though there was a marked difference in body weight, body mass index, waist circumference and percent body fat after supplementation, the results were not statistically significant. Increase in dosage time and duration of supplementation might bring statistically significant reduction in bodymass index, waist circumference and percent body fat.

Keywords: *Cinnamomum zeylanicum*, BMI, waist circumference, percent body fat

1. Introduction
Obesity and overweight poses a big problem to the contemporary population due to their faulty lifestyle. Globally, there has been an increased intake of energy-dense foods and an increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization. In 2016, more than 1.9 billion adults aged 18 years and older were overweight. Of these over 650 million adults were obese [1].

Increased BMI naturally becomes a risk factor for many non-communicable diseases like diabetes, heart disease, osteoporosis and cancer. Overweight and obesity, as well as their related no communicable diseases can be prevented by leading a healthy lifestyle. By choosing healthier food choices and performing moderate physical exercises regularly, the menace of overweight and obesity can be driven to the bay.

Spices have been used to preserve food, enhance the flavour and as remedy for various ailments. The old adage that the spice rack can be a potent medicinal chest has become true. Among spices, Cinnamon zeylanicum has amazing health benefits and it serves as an antidiabetic, antihyperlipidemic, hypotensive, antibiotic, antiulcer, anti-inflammatory, and weight reducing complementary food. One gram of cinnamon in addition to usual diet leads to dramatic improvements in blood sugar and cholesterol. At these levels, is very safe and has no side effects. In a double-blinded, placebo-controlled by Zeigenfuss [2], involving 22 subjects with prediabetes and features of metabolic syndrome, effects of supplementation with a commercially available extract of cinnamon on fasting blood glucose and body composition was determined. The subjects were divided into two groups, and given either 500 mg/day of Cinnamon or a placebo for 12 weeks. The subjects in the group receiving Cinnamon displayed decrease in fasting blood glucose (-8.4%), systolic blood pressure (-3.8%) and increase in lean mass (+1.1%), compared with the placebo group. There were also significant decreases in body fat (0.7%) in the cinnamon group.

Overweight people along with their normal diet can relish cinnamon tea regularly. Cinnamon is easily affordable, available and is also accepted as a traditional medicine both in Ayurveda and Chinese medicine. Coumarin, is also present in trace amounts in *Cinnamomum zeylanicum* species and does not cause adverse effect to one who consumes [3]. With this background the objectives of the study have been framed as, to supplement cinnamon zeylanicum tea for a period of 45 days and determine its effectiveness on body mass index, percent body fat, and waist circumference

2. Materials and methods
The study protocol was reviewed and approved by the Independent Institutional Ethics Committee of Women's Christian College, Chennai (Ethical clearance No. WCC/HSC/11EC -2014:02). Statistical power analysis was used to estimate sample size. Sixty type 2 diabetes mellitus subjects, selected at random, participated in a 15-week study that consisted of three parts. The study design was within subject's design. According to within subjects design the subjects were assessed at three different periods of time, 15 days of base line study followed by 45 days of control phase and 45 days of supplementation period. Subjects selected at random, received 75 ml of infusion containing one gram of AECZ [4]. Two kilograms of aqueous extract powder of *Cinnamomum zeylanicum (AECZ)* was procured from Navachetana Kendra, Health Care Limited, New Delhi with certificate of analysis. Packing of AECZ powder in tea bags were carried out in BGM Pharma, Madurai. Each tea bag contained one gram of AECZ powder. For the preparation of tea, subjects were instructed to adhere to the method followed by Attieh *et al*., 2015 [5]. About 100 ml of water was boiled for 5 minutes from which 75 ml of water was

used for infusion preparation. The tea bag was gently dipped in a glass containing 75 ml hot water and steeped for 15 minutes.

All the subjects who underwent supplementation trial were allowed to take their routine diabetic diet, have regular physical activity and diabetic medicine. After the completion of formal procedures, Height, body weight, waist circumference and body fat were measured. Body fat was measured using a bio-electrical impedance analyser. Blood pressure was measured using an aneroid sphygmomanometer. Anthropometric indices and blood pressure were analysed for subjects on the the1st, 46th and 91st day.

The data was entered and then analysed using Microsoft Excel (2016) and SPSS Version 16.

3. Results & Discussion

Anthropometric measurements like height, body weight, waist circumference was measured and body mass index and percent body fat was calculated.

Body mass index (BMI)

Body mass index was calculated using Quitelet index. BMI (kg/m²) = weight in Kg/height in meters^2.

Table 1: Percent distribution of subjects based on body mass index

BMI (Kg/m²)	Category	Test group I n=30		Test group II n=30	
		N	Percent	N	Percent
< 20	Under weight	7	23.3	3	10
20-25	Desirable	15	50.0	18	60
25-30	Overweight	7	23.3	6	20
>30	Obese	1	3.3	3	10

(WHO, 1995, 2000, 2004)

Results presented in Table 1 indicate that 50 percent of the subjects in test group I and 60 percent of the subjects in test group II were in desirable category of BMI classification. About 23 percent and 20 percent of subjects in test group I and test group II respectively were in the overweight category. A small percent of 3 in test group I and 10 percent in test group II were in the obese category. Type 2 diabetes develops in Asian patients at a lower mean body mass index compared with those of European descent. At any given body mass index. Asians have a greater amount of body fat and a tendency towards visceral adiposity [6]. One of the most striking observation is the incidence of type 2 diabetes at a lower body mass index in East Asian countries [7]

Table 2: Association between mean body mass index and gender

Group	Gender	n= 30	Mean ±SD	p-value
Test group I	Male	15	26.88 ±3.680	0.546
	Female	15	26.06 ±3.653	NS
Test group II	Male	13	25.51 ±3.540	0.376
	Female	17	26.86 ±4.450	NS

NS- Non-significant, *- significant at 5 % level

From Table 2, P value was found to be 0.546 in test group I and 0.376 in test group II. Since both the p values are greater than 0.05, it is inferred that there is no significant association between BMI and gender. There was a significant difference in BMI by sex, with women having a higher average BMI than men There was also a significant difference in BMI by age, with oldest subjects (> 81 years of age) having the lowest average BMI [8].

Table 3: Association of BMI with frequency of physical activity

Study group	Physical activity vs BMI	Frequency	N	Mean	p-value
Test group I	60th day – 105th day	Daily	18	25.75±3.30	0.187 NS
		3-5 times/week	12	27.56±3.97	
Test group II	60th day – 150th day	Daily	16	25.27±3.51	0.153 NS
		3-5 times/week	14	27.42±4.49	

(Independent sample t-test)

P value < 0.005 is considered significant. Results indicate that there was no significant association between BMI and physical activity in our study. Although BMI and physical inactivity are independent predictors of diabetes incidence, the magnitude of the association of physical activity with BMI is greater. The relation between times spent on walking was not influenced by BMI level [9].

Waist circumference

Waist circumference and waist/hip ratio have been used as measures of central obesity.

The presence of excess fat in the abdomen out of proportion to total body fat is an independent predictor of risk factors [10].

Table 4: Percent distribution of subjects based on waist circumference

Variable	Measurement(cm)	Test group I n=30		Test group II n=30	
		N	Percent	N	Percent
Waist circumference (cm)	< 90 – Normal	12	40	14	46.6
	> 90 - Minimal risk	10	33.3	12	40
	>100 - Moderate risk	8	26.6	4	13.3
	>110 - High risk	0	0	0	0

(American Diabetes Association, 2016)

Results indicate that none of the subjects were in the high-risk category with waist circumference above 110 cm. Forty percent of subjects in test group 1 and 46.6 percent in test group 2 had a waist circumference below 90 cm. A small percent of 26.6 percent in test group 1 and 13.3 % in test group 2 had waist circumference above 100 cm indicating moderate risk. Higher waist circumference has been associated with decreased glucose tolerance, alterations in glucose insulin homeostasis, reduced metabolic clearance of insulin, and decreased insulin-stimulated glucose disposal [11].

Percent Body fat

Percent body fat measured by leg-to-leg impedance did not show any significant difference after supplementation in both the test groups. The findings suggest that short-term cinnamon zeylanicum supplementation at doses of 1 gm/day for 45 days does not affect percent body fat.

Table 5: Changes in anthropometric measures before and after supplementation

Parameters	Study group	On 60th day	On 105th day	Test of significance
		Mean±SD	Mean±SD	P-value
BMI	Test group1	26.47±3.63	25.30±2.16	0.841 NS
	Test group 2	26.47±4.07	24.58±3.09	
WC	Test group 1	99.15±7.62	99.03±5.82	0.065 NS
	Test group 2	95.76±3.12	95.73±6.24	
% Body fat	Test group 1	26.52±4.47	26.03±5.03	0.471 NS
	Test group 2	25.46±5.43	24.18±5.19	

NS- not significant. *- Significant at 5 % level.

As observed from Table 5, the mean anthropometric parameters of the subjects did not show significant change after the supplementation period. In test group 1 the mean BMI slightly decreased from 26.47 to 25.30 whereas as there was an increase in mean BMI in the test group 2. The decrease and increase were not statistically significant for BMI, waist circumference and percent body fat.

Similar result was obtained by Anderson *et al*., 2015 in which two-month supplementation with cinnamon zeylanicum showed significant changes in blood glucose and serum cholesterol, but not in anthropometric indices.

Study by Ziegenfuss *et al*., 2006 [12] indicates that subjects with 3-month supplementation of cinnamon zeylanicum decreased their body fat by 0.7 percent (from 37.9 ± 9.2 percent to 37.2 ± 8.9 percent).

In a study by Vafa *et al*., 2012,[13] three gms of cinnamon zeylanicum supplemented for 8 weeks lead to a moderate effect on glycemic status indicator, but did not improve blood lipid profile and body composition parameters.

4. Conclusion

In the present investigation, by increasing the duration and dosage of cinnamon zeylanicum, the desired goal of reducing the body fat can be attained but compliance to ingestion of supplementation would be limited.

5. References

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