

Effects of Nutritional Counseling And Supplementation of Cinnamon on Blood Glucose Levels In Type 2 Diabetes Patients.

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Abstract: Nutrition and lifestyle modification is the most important factors that helps to control blood sugar levels. Following a healthy lifestyle also decreases further complications of diabetes. With lifestyle changes cinnamon supplementation also helps to decrease the serum glucose level. The current study aims to see the effect of cinnamon on blood glucose level of type 2 diabetes patient. Interventional study design was carried out to conduct the research which included 20 participants both case and control group. During the period of intervention of 90 days' case group were given diet and lifestyle counselling with 1gram of cinnamon and control group were given diet and lifestyle counselling. There was a significant decrease seen in the FBS levels from pre intervention to during and post intervention in both the groups ($p < .001$). There is 7.7% effect of cinnamon on fasting blood sugar level. The comparison of pre HbA1c level and the available post HbA1c level shows that there is a significant decrease in the levels but there is not much difference seen between the groups. Cinnamon supplementation could be considered as an additional dietary functional food along with dietary counseling to regulate blood glucose levels.

Index Terms- Type II Diabetes, Cinnamon supplementation, Diet and Lifestyle counseling, fasting blood glucose.

Introduction

Diabetes is widely spread and in most of the countries it is growing very fast especially in low and middle income countries . Diet and lifestyle is of the important causative factors for type 2 diabetes. Several studies states that herbs help in regulating the blood glucose levels, regulating lipid metabolism, antioxidant production etc. Cinnamon is one of most beneficial herb that has the beneficial property of doubly-linked polyphenol type-A compounds to control glucose levels . Literature states that there is a significant reduction in blood glucose levels in subjects who were subjected to cinnamon ranging from 1gram to 6 grams over the period of 40 days. Three grams of cinnamon was supplemented for 8 weeks of span where there was decrease in HbA1c level, fasting blood glucose, body fat, BMI and triglycerides levels in the experimental to which cinnamon is given as sample when compared to base line not with placebo .One group was given low-dose of cinnamon (2g) and the other group was given high dose of cinnamon (6g) for 3 months (around 91 days). There was a significant reduction in HbA1c level and fasting blood glucose level in both low dose and high dose group. The HbA1c in low dose group reduced by average of 0.67% and in high dose group it was reduced by average of 0.92%. The fasting blood glucose level decreased in low dose group was an average of 1.01mmol/l and the average reduction in high dose group is 1.62mmol/l .

Research Design and Methods

Interventional study design was carried out in which twenty subjects with type 2 diabetes in two parallel groups. Fasting blood sugar (FBS), HbA1C, body weight, height, waist and hip circumference were measured at baseline and every 30 days' intervention FBS testing was done and at 90th day FBS and HbA1c tests were repeated again. Socio demographic information was collected during the course of interviewing the subjects and socio economic status is classified on basis of Kuppuswami scale 2014. Subjects were recruited from Kasturba Hospital Manipal medicine department. Subjects were randomly assigned to a supplement group (n=20) and control group n=20). Each subjects in supplement group instructed on following a diet and lifestyle with 1gram of cinnamon mixed in water to be consumed every day for 90 days. Control group subjects were counseled on diet and life style management only. Telephonically subjects were in contact with the research team monitoring their diet and wellbeing.

Main outcome measures were changes in fasting blood glucose measured every 30 days' interval and HbA1C at the end of 90 days. The primary statistical analysis consisted of repeated measures and simple linear regression.

Results and Discussion

Table 1: Baseline Characteristics of Subjects

Parameters	Supplement Group (n=20)	Control Group (n=20)
Gender	N = %	N= %
Male	9(45%)	13(65%)
Female	11(55%)	7(35%)
Age Group		
30-45	3(15%)	6(30%)
46-60	13(65%)	9(45%)
>60	4(20%)	5(25%)
Socio economic status		
Upper	10(50%)	7(35%)
Upper middle	6(30%)	9(45%)
Lower middle	4(20%)	3(15%)
Upper Lower		1(5%)

Table 1 presents sociodemographic data of the subjects in which majority were males in both the groups as compare to females. 13(65%) and 9(45%) of the participants from both the groups were in the age range of 46-60. 10(50%) and 9(45%) of the participants were in upper class, 6(30%) and 7(35%) were in upper middle class and so on.

Table 2: Anthropometric Assessment:

Anthropometric measurements	Supplement group (n=20)	Control (n=20)
BMI Class	n(%)	n(%)
Normal weight	3(15%)	5(25%)
Over weight	4(20%)	2(10%)
Moderately obese	11(55%)	9(45%)
Highly Obese	2(10%)	4(20%)
Waist circumference		
Low	4(20%)	4(20%)
High	5(25%)	9(45%)
Very high	11(55%)	7(35%)
Waist hip ratio		
Normal	1(5%)	1(5%)
Obese	19(95%)	19(95%)

Table 2 gives the anthropometric assessment of the subjects. 11(55%) and 9 (45%) of the subjects in both the groups were in moderately obese condition, 4(20%) and 2(10%) subjects were overweight, 2(10%) and 4(20%) were in highly obese and rest of them 3(15%) and 5(25%) were in the normal category. Majority of the subjects in both the groups had high and very high waist circumference of 5(25%), 11(55%) and 9(45%) and 7(35%). Waist hip ration indicated that 95% in both the categories were classified to be obese. Body fat deposition is one of the risk factors for obesity related disease and excess abdominal fat has as association with cardio metabolic diseases .

Table 3: Biochemical parameters

Mean Difference of pre intervention FBS and HbA1c (N=20)

	Category	Mean	Std. D	P value
FBS	case	161.35	53.5	0.023*
	control	143.1	23.2	
HbA1c	case	7.932	1.15	0.76 ^{NS}
	control	8	1.37	

NS not significant. * significant at 5%

Table 3 indicates the mean difference between pre two groups. Between supplement and control group there is a significant difference in the FBS value (161.35 ± 53.5) (143.1 ± 23.2) $p=0.023^*$. HbA1c there is no significant difference between the groups and but in both the groups value were above the normal range (7.93 ± 1.15 , 8 ± 1.37 $p=0.76$).

Table 4: Mean Difference of Physical Activity Level

	Category	N	Mean	Std. Deviation	P value
Physical Activity level	case	20	1.465	0.10	0.25 ^{NS}
	control	20	1.475	0.16	

NS not significant.

Table 4 shows the difference between physical activity level between the groups which indicates most of them are in sedentary category and no significant difference between the groups were found (1.46 ± 0.10 , 1.47 ± 0.16). Sedentary lifestyle had an association with increased levels of blood glucose level.

Table 5: Comparison of FBS pre, during and post intervention of both the groups using repeated measures.

	Case	Control			
	Mean \pm SD	Mean \pm SD	D F	F value	p value
FBS Pre intervention	161.35 \pm 53.5	143.1 \pm 23.298	1.157	16.41	<001* *
FBS follow up 1	138.95 \pm 28.34	137.977 \pm 26.765			
FBS Post intervention	131.71 \pm 23.416	130.817 \pm 29.294			

Control

Biochemical parameters		Mean difference(I-J)	p-value	95% Confidence Interval for Difference	
				Lower	Upper
Pre intervention	During	5.123*	.009*	1.4	8.78
	Post	12.283*	<.001**	6.2	18.3
During	Pre	-5.123*	.009*	-8.7	-1.463
	Post	7.160*	.010*	1.9	12.412
Post	Pre	-12.283*	<.001**	-18.3	-6.226
	During	-7.160*	.010*	-12.4	-1.908

Case

Biochemical parameters		Mean difference (I-J)	p-value	95% Confidence Interval for Difference	
				Lower	Upper
Pre intervention	During	22.400*	.007**	7.027	37.773
	Post	29.640*	.005**	10.127	49.153
During	Pre	-22.400*	.007**	-37.773	-7.027
	Post	7.240*	.015*	1.595	12.885
Post	Pre	-29.640*	.005**	-49.153	-10.127
	During	-7.240*	.015*	-12.885	-1.595

Fig 1:

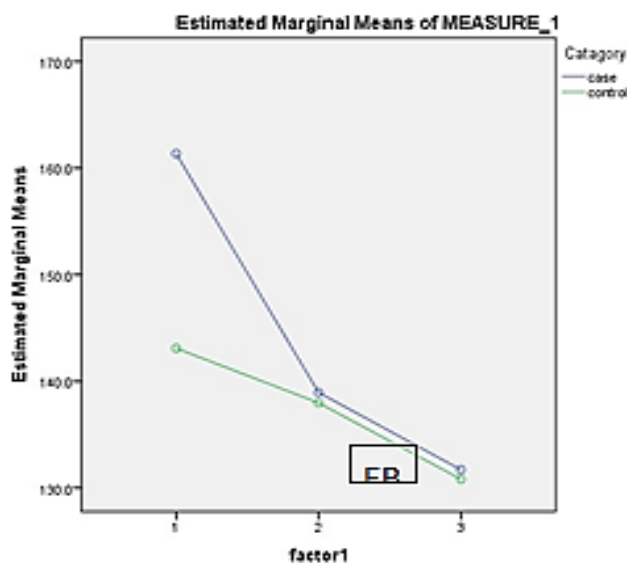


Table 5 indicates Comparison of FBS pre, during and post intervention of both the groups using repeated measures. It is observed that there is reduction in FBS from pre to during and post intervention in both the groups. In supplement group there is greater reduction in FBS values as compared to control group and its significant at 1% level (Case: 161.35 ± 53.5 , 138.95 ± 28.34 , 131.71 ± 23.416 Control: 143.1 ± 23.298 , 137.977 ± 26.765 , 130.817 ± 29.294 , $P = < .001^{**}$). In post hoc table of case it is evident that from pre to during to post intervention there is a great reduction in blood sugar vales which is significant at 1% level ($P = 0.007^{**}$ and 0.005^{**}) and in comparison to control group there is also reduction in blood sugar level in significant amount from pre intervention to during to post intervention (0.009^{**} and 0.001^{**}). Similar results were found in studies done by where 12 weeks of intervention of cinnamon supplementation there was significant reduction in fasting blood glucose in supplement group as compared to control group. Fig 1 graph shows the fasting blood glucose level decrease in much higher as compared to control group.

Table 6: Effect of Cinnamon on the Fasting blood sugar level

	Regression Coefficient	p-Value	95% Confidence Interval for Difference	
			Lower	Upper
Cinnamon category	0.077	.083 NS	-2.407	37.117

NS not significant.

Simple linear regression was performed to know the effect of cinnamon on the fasting blood sugar level. According to the above table the R² value is 0.077 which indicates that there is 7.7% effect of cinnamon on the fasting blood sugar levels. The comparison of pre HbA1c level and the available post HbA1c level shows that there is a significant decrease in the levels but there is not much difference seen between the case ($p = 0.031$) and control group ($p = 0.003$). Similar study where in there was a significantly higher reduction in the cinnamon group (10.3%) than in the placebo group (3.4%). No significant intragroup or intergroup differences were observed regarding HbA1c.

Conclusion

Intake of 1g of cinnamon for 8 weeks significantly reduces the FBS levels among type 2 diabetes patients. Cinnamon supplementation could be considered as an additional dietary functional food along with dietary counseling to regulate blood glucose levels along with conventional medication to treat type 2 diabetes.

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