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Impact of Nutrition Counseling and Supplementation of Medicinal Plants on the Anthropometry and Blood Pressure of the Diabetic Subjects

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ABSTRACT Sixty non insulin dependent male diabetic subjects were selected from PAU Hospital, Ludhiana. Selected subjects were divided into two categories according to their grades of obesity i.e. overweight and normal weight to take their anthropometric measurements. After assessing the basic knowledge of the subjects about the disease by knowledge testing questionnaire, the subjects were imparted nutrition education regarding the disease, its symptoms, causes, complications and dietary modifications. Supplementation of three medicinal plants namely bittergourd, jamun seeds and fenugreek seeds was done along with nutrition education. These plants were dried, powdered and mixed in equal proportions and two gram of this mixture was given to the subjects for a period of 3 months. The height, weight, mid upper arm circumference, tricep skinfold thickness and BMI of the subjects was measured before and after experimental period. A significant decrease in weight (74.3 to 70.14 kg), body mass index (27.47 to 25.84 kg/m) and MUAC (27.69 to 25.70 cm) was observed in overweight subjects and there was increase in the percentage (65 to 82%) of normal weight subjects having BMI between 20-25. The mean systolic (136 to 123 mm Hg) and diastolic (90 to 83 mm Hg) blood pressure decreased significantly ($P \leq 0.05$) after intervention. Hence, it can be said that supplementation of these traditional medicinal plants and nutrition counseling is an effective measure to bring about favourable and significant changes in anthropometry of the diabetic subjects.

INTRODUCTION

Diabetes mellitus is an endocrinological disorder in which nutrition education plays an important role in the control of hyperglycemia and further help in the retardation of secondary complications. People who eat too much food and lead a sedentary life become overweight and obese. Obesity reduces the sensitivity of tissues to the action of insulin and in the utilization of glucose. Obesity has long been accepted as a major risk factor of NIDDM and the risk is related to both duration and degree of obesity (Drenick et al., 1980). Body fat distribution is an important variable to consider between obesity and metabolic complications such as insulin resistance, hyperinsulinemia and diabetes mellitus (Bjornstrops, 1991). The amount of visceral fat played an important role in relationship between regional fat distribution and metabolic complications (Despres, 1991). The risk of developing diabetes in adults with body mass index more than 30 is five times that of adults with BMI<25. Kaye et al. (1991) studied the relationship between body fat distribution by the ratio of waist hip (WHR) and found that new onset of diabetes had significantly greater body mass index and WHR than non cases.

Studies by various workers clearly indicates that obesity and NIDDM is interlinked and nutrition education is very important to educate the people about the disease, its complications and how to reduce the secondary complications by reducing weight and dietary management. So the present study has been planned to see the impact of nutrition education on the anthropometry and blood pressure of the diabetic subjects.

MATERIAL AND METHODS

Selection of the Subjects: Sixty non insulin dependent male diabetic subjects in the age group of 40-60 years were selected from Punjab Agricultural University Hospital, Ludhiana. Selected subjects were divided into two categories according to their grades of obesity i.e. overweight and normal weight subjects.

Nutrition Counseling: After assessing the basic knowledge of the selected diabetic subjects about the disease by knowledge testing questionnaire, the subjects were imparted

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nutrition education after every 15 days during 3 months period. Education regarding diabetes, types of diabetes, the causes, symptoms, complications, dietary management and use of traditional medicinal plants in their daily diet was imparted to the patients by delivering lectures, by showing transparencies and by giving demonstrations, with special emphasis on weight reduction as major goal for the treatment. At every stage of education programme, questions from the subjects were encouraged and various dietary adherence problems were solved. Summary of lectures on diabetes and dietary treatment, food exchange lists, sample menu of 1400 kcal and 1800 kcal diet were given as handout to each subject. 1400 and 1800 kcal diet was prescribed to over and normal weight subjects respectively.

Supplementation of Medicinal Plants: Along with nutrition education, supplementation of traditional medicinal plants in the diet of the subjects was done. Three traditional medicinal plants known for their hypoglycemic and hypolipidemic effect namely bittergourd, jambu seeds and fenugreek seeds were cleaned, washed, dried, powdered and mixed in equal proportions(1:1:1) and two gram of this powdered mixture in the form of capsules was incorporated in their daily diet for a period of 3 months. The subjects were instructed to visit the hospital after every week to collect the supplement and to clarify any problem of adherence.

Pre and Post Testing of Knowledge of Diabetic Subjects: The subjects knowledge regarding diet and diabetes and use of traditional medicinal plants in their diet was assessed using same knowledge testing questionnaire after 3 months feeding period and differences in knowledge score was calculated.

Anthropometric Measurements: Height, weight, MUAC, TSFT, waist to hip ratio was measured before and after nutrition intervention by using standard methods given by Jellife (1966) and BMI was calculated by using formulae weight in kilogram/height in meter square and subjects were categorized according to classification given by James et al., (1988).

Measurement of Blood Pressure: It was recorded with Sphingomanometer by physician by method given by Maclead (1984).

Statistical Analysis: The data on anthropometric measurements, blood pressure was analysed statistically. The mean, standard error, analysis of variance, CD value, t-value and their test of significance was calculated using Computer Package Programme (Cheema and Singh, 1990).

RESULTS AND DISCUSSION

The anthropometric parameters of the subjects before and after intervention is presented in Table 1. The mean height of the subjects was 165.9 cm. Non-significant difference was observed between height of overweight and normal weight subjects. The mean weight of overweight subjects decreased significantly ($p \leq 0.01$) from 74.3 to 70.14 kg while there was non-significant change in weight of normal weight subjects as a result of intervention. The reduction in body weight of the overweight subjects was consistent with energy restriction, but energy reduction did not have any significant

Table 1: Major anthropometric measurements of the subjects before and after intervention.

Variables	*Over weight n=21*			*Normal weight n=39*			*All subjects n=60*		
	Before inter-vention	*After inter-vention*	*t-value*	*Before inter-vention*	*After inter-vention*	*t-value*	*Before inter-vention*	*After inter-vention*	*t-value*
Height (cm)		164.8±6.38		166.5±6.71			165.9±6.63		
Weight (kg)	74.3±7.64	70.14±6.96	1.81*	64.16±6.84	62.94±6.15	0.78^{NS}	67.72±8.63	65.45±7.29	1.51^{NS}
Body mass index kg/m2	27.47±2.27	25.84±2.20	2.29**	23.22±1.37	22.7±1.23	1.51^{NS}	24.7±2.67	23.81±2.20	1.90*
Mid upper arm circumference (cm)	27.69±2.44	25.70±2.33	2.63***	25.3±1.67	24.9±1.60	0.77^{NS}	26.1±2.29	25.23±1.92	2.27**
Tricep skin fold thickness (mm)	12.75±2.95	11.90±2.65	0.96^{NS}	10.6±2.05	10.3±1.84	0.58^{NS}	11.35±2.62	10.88±2.28	1.03^{NS}
Waist to hip ratio	0.98±0.04	0.97±0.04	0.42^{NS}	0.97±0.08	0.94±0.08	0.07^{NS}	0.98±0.07	0.97±0.07	0.08^{NS}

Values represent Mean ± S.E. ***Significant at 1% **Significant at 5% *Significant at 10%

effect on the body weight of normal weight subjects. It is possible because of corresponding decrease in energy expenditure or resting metabolism, the body of normal weight was able to maintain its weight in the obese of decreased energy intake.

Vishwanathan (1991) also reported no change in body weight in normal weight NIDDM patients and non-significant decrease in obese subjects after dietary counseling. Albu (1998) reported that obesity is very common in non-insulin dependent diabetes, so weight management is an important component of diabetes treatment. Weight loss through hypocaloric diet reduces the insulin resistance and hyperglycemia.

A desired index of fatness from weight and height was used to classify the subjects into grades of obesity according to classification proposed by James et al., (1988). About 65 percent of the subjects were normal weight and 35 percent moderate to severely overweight in 1st and 2nd grades of obesity before intervention (Table 2). After intervention, percentage of subjects in normal weight increased to 82% and 18% in moderate and severe overweight. Initially BMI of overweight and normal weight subjects was 27.47 and 23.2 kg/m^2 respectively. A significant decrease ($p \leq 0.05$) from 27.47 to 25.84 was observed in overweight subjects after nutrition intervention while there was non-significant change in normal weight subjects.

Mid upper arm circumference value of overweight subjects before and after intervention was significantly higher ($p \leq 0.05$) than normal weight counterparts both before and after intervention. A significant ($p \leq 0.01$) decrease of MUAC was observed in overweight subjects and non-significant change in the normal weight subjects after intervention. MUAC value of over and normal weight subjects was low as compared to standard of 29.3 cm given by Jelliffe (1966). It was found that there was non-significant decrease ($p \leq 0.05$) in skinfold thickness at triceps both by overweight and normal weight subjects after intervention. However, this value was significantly ($p \leq 0.05$) higher for overweight subjects as compared to normal weight subjects before and after intervention. In comparison with the standard (12.5 mm) laid down by Jelliffe (1966) for adult males, a significant lower values were in normal weight subjects while values for obese subjects were comparable to these standard. In accordance with the present findings Abraham and Jagannathan (1989) also found reduction in mean value of skinfold thickness in obese.

There was no significant decrease ($p \leq 0.05$) in waist to hip ratio was observed in overweight and normal weight subject after intervention. There was non significant difference ($p \leq 0.05$) in the value between normal and overweight subjects before and after intervention. Ashwell et al. (1985) and Seidell et al. (1991) suggested that the determination of waist to hip ratio (WHR) is a common and simple method for assessment of fat distribution. The ratio has been found to be more strongly related to visceral fat than to subcutaneous fat. In comparison with the standard values for waist hip ratio i.e. one for adult males, a slightly lower values were found in both normal and obese subjects.

Before intervention, the mean systolic blood pressure of the overweight and normal weight subjects was 140.95 and 134.74 mm Hg and decreased significantly $p \leq 0.05$ in overweight and normal weight subjects after intervention (Table 3). The mean diastolic blood pressure of overweight and normal weight subjects was 93.33 and 84.77 mm Hg before intervention and decreased significantly ($p \leq 0.05$) in overweight subjects (93.33 to 84.29 mm Hg). The mean systolic and diastolic pressure was on the higher side in all the subjects (137/90) than the normal value before nutrition intervention which decreased to 123/83 after nutrition intervention and is comparable with the normal value 120/80 given for systolic and diastolic blood pressure. The values of >160 mm Hg systolic and >95 mm Hg diastolic is used as criterion for hypertension (Berchtold, 1981). Based on this criterion, before

Table 2: Distribution of subjects according to grades of obesity.

Grades	*BMI*	*Interpretation of BMI category*	*Subjects n=60*			
			Before intervention		*After intervention*	
			No.	*%*	*No.*	*%*
0	20-25	Acceptable weight	39	65	49	82
1	25-30	Moderate weight	18	30	10	17
2	>30	Severe overweight	3	5	1	1

Classification proposed by James et al. (1988)

Table 3: Mean blood pressure of the subjects before and after nutrition intervention

Blood pressure (mm Hg)	*Over weight n=21*			*Normal weight n=39*			*All subjects (n=60)*		
	Before inter-vention	*After inter -vention*	*C.D 5%*	*Before inter-vention*	*After inter -vention*	*C.D 5%*	*Before inter -vention*	*After inter -vention*	*C.D 5 %*
Systolic	140.95±2.60	127.14±0.99	5.76	134.74±2.21	121.28±0.74	4.71	136.91±2.37	123.33±0.88	5.17
Diastolic	93.33±1.40	84.29±1.08	3.66	84.77±0.99	80.26±0.44	2.19	90.43±1.21	83.0±0.81	4.26

Values represent mean ± S.E. C.D. at 5% level

nutrition intervention, 8% were hypertensive on the basis of systolic blood pressure while 15% were hypertensive on the basis of diastolic blood pressure, among all the subjects and majority of them were overweight. None of the subjects was hypertensive after nutrition intervention. The association between NIDDM and hypertension has been reported to be independent of age and obesity (Teuscher et al., 1989).

Nutrition counseling and supplementation improved their knowledge regarding the disease and thus, developed positive attitude for dietary interventions. The mean score of diabetic knowledge improved significantly ($p \leq 0.01$) from 7.31 to 19.26 (Table 4). The percentage of subjects using traditional medicinal plants increased from 28.33% to 71.66% after nutrition education. Results are in agreement with the result of Gulati, 2000 who reported that nutrition education leads to an improvement in the diabetic state and reduces the risk of secondary complications in NIDDM subjects.

CONCLUSION

It can be concluded that nutrition counseling and supplementation of traditional medicinal plants is an effective measure to bring about favourable and significant changes in the anthropometry of the diabetic subjects.

Table 4: Diabetic knowledge test score before and after nutrition education.

Knowledge test score	*Before nutrition-education*	*After nutrition-education*
Subjects getting zero score	16(26.66)	None
Subjects getting above 80%	None	28(46.66)
Mean knowledge test score	7.31±6.61	19.26±4.58***
Subjects using traditional medicinal plants	17(28.33)	43(71.66)

Figure in parentheses indicate percentages
*** Significant at 1% percent level.

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