

Effect of Exercise on BMI and Biochemical Profile of Selected Obese Diabetic Women

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Abstract

The present study was undertaken to investigate the effect of modified diet and exercise among the selected 100 obese type 2 diabetic women in the age group of 25-45 years having fasting blood sugar levels above 150mg/dl, post prandial blood sugar level above 250mg/dl and with elevated blood lipid values. Out of the hundred subjects, 40 were taken as control group (Group I) and the remaining 60 were divided into 3 groups of 20 each as experimental group II, III and IV respectively. All the subjects were advised to take the diet with modified calories as per their Ideal Body Weight but group II, III and IV were advised with different exercise pattern like walking (30 minutes), treadmill (30 minutes) and walking and treadmill (15 minutes each) respectively along with modified diet. Results revealed that, among the three types of exercises, treadmill exercise shows significant reduction in body mass index (BMI), fasting blood sugar, post prandial blood sugar, total cholesterol, triglyceride, low density lipoprotein (LDL) and body fat and significant increase in high density lipoprotein (HDL) level.

Key Words: Walking, Treadmill, BMI, Blood Sugar, Lipid Profile

Introduction

Diabetes is one of the oldest diseases documented in medical literature before over 2000 years (*The Hindu, 2000*). World over in 2003, there were 180 million diabetics and the estimated prevalence of diabetes by the beginning of the new millennium in the year 2025, will be 500 million globally and India may have the maximum number of diabetics (57.2 million) in the world (*The Hindu, 2004*).

Diabetes mellitus is a chronic disorder of glucose metabolism resulting from dysfunction of pancreatic beta cells and insulin resistance. It is still a series health problem all over the world (*Day, 2000*). Physical inactivity leading to increase in obesity is considered to be an important reason for the development of diabetes in various populations. The prevalence of

obesity has increased considerably in many countries in recent decades and is affecting both sexes (*Boker et al., 2005*).

Even though millions of people all over the world are affected with diabetes, not all are well informed about the nature of the disease (*Raghuram and Swaransharma, 2003*). Lower education has been reported to be associated with higher obesity rates. *Boker (2005)* reported that age, education and origin were important risk factors for obesity in women. In general, due to lack of dietary control and energy expenditure by adequate exercise, the obese women with diabetes mellitus experience disturbed blood glucose level; lipid profile and body fat and thus aggravate the problems associated with diabetes.

According to *Bauman (2004)*, the physical activity confers a positive benefit

on health that includes updates in all cause mortality and in cardiovascular, diabetes and in obesity prevention. *Mary et al.*, (1999) states that exercise is a wonderful drug and is freely available to almost everyone. It can prevent or delay the onset of type 2 diabetes, controls blood sugar levels in people with diabetes, cuts the risk of heart disease, high blood pressure and colon cancer, improves mood and gives a sense of well being, promotes weight loss and an improved appearance and is not only easy, but pleasant to take. Exercise was advocated as beneficial for patients with diabetes. Thus exercise – together with insulin and diet was considered as one of the three central elements in the management of diabetes (*Amisola, 2003*). Thus the present study focuses attention on the importance of exercise and modified diet in reducing weight, improving blood glucose and lipid profile values in selected obese diabetic women.

Materials and Methods

The study was conducted on 100 type 2 diabetic women in the age range of 25 to 45 years who were using oral hypoglycemic drugs and were free from complications like hypertension, cardiac disease etc. The other criteria for the selection of the subjects included BMI (>25), body fat (>30%), disturbed blood glucose (BG) values (fasting BG 150-175mg/dl and post prandial BG 250 to 275 mg/dl) and disturbed lipid profile (Low Density lipoprotein 150 to 170 mg/dl., Serum Cholesterol 1 225 to 275 mg/dl, Serum Triglyceride 150 to 200 mg/dl, High Density lipoprotein 30 to 55 mg/dl)

The selected patients were divided into 4 Groups. Group I constituted of 40 diabetics that served as the control group and the remaining 60 subjects were equally divided into three experimental groups as

group II, III and IV. All the hundred subjects were recommended to take the diet with modified calories as indicated by their ideal body weight calculation for a period of 60 days. The experimental groups were instructed to undergo different exercise regimens for 60 days in addition to the recommended diet. Group II subjects were advised 30 minutes of walking and Group III subjects did 30 minutes of treadmill exercise while Group IV subjects were administered a combination of normal walking and treadmill exercise each of 15 minutes duration daily.

BMI, blood glucose levels (fasting and post prandial), lipid profile and body fat percentage of all the patients were measured at the start and finally after 60 days of the study using standard techniques.

Information regarding the socio-personal profile of all the selected subjects was collected by using the interview schedule proforma.

Results & Discussion

Information collected from the subjects relating to their age, educational status, physical work, type of family, their dietary pattern, total income and expenditure on food are presented in Table 1.

Table 1. Socio- Personal Profile of the Selected Diabetic Patients

DETAILS	% age of respondents (N=100)
Age wise distribution (in years)	
25-30	20
31-35	26
36-40	11
41-50	43
Literacy level	
Primary (1-5)	10
Middle (6-8)	19
Secondary (9-10)	12

Higher secondary (11-12)	12
Under Graduate	13
Post Graduate	10
Illiterate	24
Nature of Work	
Sedentary	90
Moderate	10
Heavy	-
Type of Family	
Nuclear	63
Joint	37
Dietary Pattern	
Vegetarian	21
Non-Vegetarian	79
Total income per month	
Economically weaker section (below Rs. 2100)	09
Low Income Group (Rs.2101-Rs.4500)	26
Middle Income Group (Rs.4501-Rs.7500)	43
High Income Group (Above Rs.7501)	22
Income spent on food	
20-40%	20
40-60%	41
61-80%	30
81% and above	09

Weight (in Kg)					
Group I	72.1 ±6.74	69.4 ±6.39	2.7	2.69*	<0.01
Group II	72.3 ±7.68	68.0 ±7.20	4.3	2.68*	<0.05
Group III	64.3 ±7.61	58.7 ±7.58	5.6	3.30*	<0.01
Group IV	72.9 ±5.95	67.0 ±6.26	5.9	4.36*	<0.01
BMI (Kg/M ²)					
Group I	29.6 ±1.86	28.6 ±1.77	1.0	3.49*	<0.01
Group II	31.1 ±3.60	29.3 ±3.40	1.8	2.37**	<0.05
Group III	31.6 ±3.07	27.0 ±3.00	4.6	6.85*	<0.01
Group IV	31.1 ±2.31	26.9 ±1.94	4.2	8.85*	<0.01
Body Fat %					
Group I	36.0 ± 1.78	33.0 ±1.43	3.0	10.70*	<0.01
Group II	35.0 ± 1.89	30.0 ±1.41	5.0	15.82*	<0.01
Group III	40.0 ± 2.10	31.0 ±2.44	9.0	16.66*	<0.01
Group IV	38.0 ±1.99	32.0 ±3.79	6.0	7.14*	<0.01

Note: *-Significant at 1% level **Significant at 5% level

Impact results of modified diet and exercise.

Results regarding the height showed that 85% of the selected subjects ranged between 141-170cm, and only 6 and 9% of the subjects were above 171 cm or below 140 cm respectively. With regard to the weight 97% of the subjects demonstrated their body weight between 56 to 85 Kg and only 3 % of the subjects had their weight between 45 to 55 kg.

Table 2. Effect of diet control and exercise advice on weight, BMI and body fat of diabetic patients

Initial Mean ±S.D.	Final Mean ±S.D.	Change	't'	P
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A significant decrease in weight, BMI and body fat values was observed in all the groups after the completion of the study and the magnitude of decrease was found to be greater among the experimental groups as compared to control group. Among the experimental groups, a greater decrease in weight, BMI and body fat was noticed in group III subjects who followed the controlled dietary schedule coupled with treadmill exercise for 30 minutes for a period of 60 days.

Biochemical Profile

There was a significant decrease at one percent level in fasting and post prandial blood glucose levels in all the four groups after the study period. But more

significant reduction was found in group III who followed the diet control with treadmill exercise for 30 minutes for a period of 60 days.

Table 3. Effect of diet control and exercise on blood glucose levels (mg/dl) of the patients

	Initial Mean ±S.D.	Final Mean ±S.D.	Change	't'	P
Fasting Blood Glucose (in mg/dl)					
Group I	168.5 ±8.86	153.2 ±8.90	15.3	10.88*	<0.01
Group II	167.5 ±8.21	138.4 ±8.82	29.1	15.28*	<0.01
Group III	163.7 ±8.08	113.4 ±8.90	50.3	26.30*	<0.01
Group IV	166.8 ±8.10	121.0 ±11.0	45.8	21.43*	<0.01
Post Prandial Blood Glucose (mg/dl)					
Group I	263.5 ±7.3	250.9 ±7.5	12.6	10.76*	<0.01
Group II	264.1 ± 8.0	233.0 ±7.8	31.1	17.67*	<0.01
Group III	264.8 ± 6.1	205.1 ±12.0	59.7	28.00*	<0.01
Group IV	264.5 ±7.1	221.1 ±5.5	43.4	31.00*	<0.01

Note: - *- Significant at one percent level.

An exercise program can be an important part of a treatment regimen for NIDDM. According to *Lampman and Sehteigart (1994)*, regular exercise programs potentiate the effects of diet or sulfonylurea therapy to lower glucose levels and improve insulin sensitivity in obese NIDDM subjects

Exercise tends to lower the blood sugar in the diabetic in whose body there is an adequate supply of endogenous insulin. This effect is so striking and so beneficial that exercise along with diet and insulin is now accorded a definite and prominent place in the everyday treatment of diabetes (*Rajiswamy, 1995*)

Table 4. Effect of diet control and exercise on lipid profile (mg/dl) of the selected patients

	Initial Mean ±S.D.	Final Mean ±S.D.	Change	't'	P
Total Cholesterol (in mg)					
Group I	251.6 ±16.04	226.4 ±20.26	25.2	7.63*	<0.01
Group II	252.5 ±16.67	200.8 ±16.40	51.7	14.04*	<0.01
Group III	252.4 ±16.49	166.0 ±18.40	86.4	21.02*	<0.01
Group IV	254.4 ±12.32	189.0 ±15.56	65.4	18.53*	<0.01
Triglycerides (Kg/M²)					
Group I	176.8 ±14.31	154.6 ±14.22	22.2	9.73*	<0.01
Group II	175.6 ±15.36	120.4 ±14.00	55.2	17.95*	<0.01
Group III	175.6 ±14.65	89.8 ±13.42	85.8	28.60*	<0.01
Group IV	177.1 ±14.73	108.1 ±14.41	69	91.42*	<0.01
Low Density Lipoproteins					
Group I	160.0 ±6.63	142.0 ±11.3	18.0	9.94*	<0.01
Group II	160.3 ±5.84	137.1 ±8.07	23.2	12.80*	<0.01
Group III	160.3 ±5.84	120.3 ±6.08	40.0	29.44*	<0.01
Group IV	160.3 ±5.84	125.8 ±6.1	34.5	25.36*	<0.01
High Density Lipoproteins					
Group I	41.9± 7.0	51.0 ±7.4	9.1	7.01*	<0.01
Group II	43.8 ±7.1	66.3 ±6.4	22.5	19.56*	<0.01
Group III	43.8 ±7.0	81.1 ±6.2	37.3	25.25*	<0.01
Group IV	43.8 ±7.0	74.7 ±6.1	30.9	21.16*	<0.01

Note: *-Significant at one percent level

The Total cholesterol, Triglyceride and LDL confirmed significant reduction at 1 % level in all the four groups after treatment (Table 4). Among the four groups,

Group III which practiced the treadmill exercise had showed the remarkable reduction than the other three groups. In case of High Density lipoprotein, all the groups showed significant increase at 1% level but it was prominent in group III which followed the diet control with treadmill exercise.

Mary *et al* (1999) in their study reported a trend towards weight loss after following a low intensity aquatic exercise programme 3 times per week with duration of 45 minutes. They observed no change in total lipid profile, blood pressure, and heart rate after the exercise programme.

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