

Effect of Lifestyle Intervention on Glucose Regulation among Individuals without Glucose Intolerance or Diabetes mellitus. A Clinicopathological Study in National Capital Region (NCR) Among 1039 Patients.

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ABSTRACT

Background: Diabetes is one of the widely occurring diseases acting as a threat to mankind. 65% of the diabetic deaths are due to cardiovascular complications therefore diabetes acts as a major risk factor for vascular diseases. Sedentary lifestyles followed by today's generation with unhealthy eating habits and obesity are the major risk factors for diabetes. The current study aims at evaluating the effect of lifestyle intervention on glucose regulation among individuals without glucose intolerance or diabetes. **Methods:** The study was conducted during a 3 month period. In this study the participants were randomly divided into control and intervention group. Data regarding age, weight, height was recorded from all. The candidates in the intervention group were taught about healthy eating habits, improving their physical activity etc. The follow up was done at an interval of 1 month and 3 month. Changes occurring in the baseline values were recorded. The data was analysed by SPSS software. **Results:** Out of 1039 candidates, 520 candidates were included in Group I and 519 candidates in Group II. Age, sex and height were similar amongst both the groups showing no significant difference. Mean systolic blood pressure, diastolic blood pressure, fasting blood sugar level were higher in control group compared to intervention group. The intervention group demonstrated a change in physical activity by 37.5 +/- 8.2 hours/ week compared to 12.3 +/- 5.1 hours/week. The BMI amongst the intervention group demonstrated a mean decrease by 0.21 +/- 0.1 whereas the control group showed an increase by 0.17 +/- 0.2. The difference was not significant between the groups. **Conclusion:** Lifestyle interventions influence the risk factors associated with diabetes or various other diseases. Thus any alterations in risk factors can decrease or increase the chances of occurrence of the disease.

Keywords: Diabetes, Intervention, lifestyle, Systolic.

INTRODUCTION

Diabetes is a great burden on the society, economy and human health due to its extensive treatment costs and vast majority of complications.^[1] 65% of the diabetic deaths are due to cardiovascular complications therefore diabetes acts as a major risk factor for vascular diseases.^[2]

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Sedentary lifestyles followed by today's generation with unhealthy eating habits and obesity are the major risk factors for diabetes. Improving upon these conditions is thought to reduce the incidence of

diabetes.^[3-5] Lifestyle changes like changes in diet, increasing physical activity and exercising are the key components for prevention and management of diabetes.^[6,7]

In order to conduct a prospective study on effect of lifestyle intervention on diabetes amongst people with normal glucose levels, a large follow up period and a large sample size is required. All these things are difficult and costly to manage.^[8] If the incidence of diabetes is reduced, then the mortality rate associated with cardiovascular disease will also be decreased. If improving the lifestyle of a person decreases the chances of diabetes, then this is the most cost effective measure in the healthcare sector. The current study aims at evaluating the effect of lifestyle intervention on glucose regulation among individuals without glucose intolerance or diabetes.

MATERIALS AND METHODS

The study was conducted by the institute, state between August 2015 - October 2015. All the individuals were informed about the study and a prior ethical committee clearance was obtained. The participants were randomly divided into two groups. Group I was the intervention group and Group II was control group. Couples were taken into single group to avoid exchange of information. The participants were given a Performa to fill in regarding their age, daily physical activity and family history. The study consisted of two health examinations- one was complete physical examination and other was collection of blood samples for various laboratory investigations by trained personnel.

Patient's body weight was measured by electronic scale and a stadiometer was used to measure their height. Blood pressure was taken as mean of two values recorded at an interval of 1 minute while the candidate was lying in supine position. The candidates were allowed to rest for 5 minutes before the readings. For measuring plasma glucose, enzymatic method with semi biochemistry analyzer was used.^[9,10] Plasma HDL cholesterol and triglyceride levels were measured by enzymatic methods and Friedeneald's equation was used for estimation of plasma LDL cholesterol levels.^[11] Patients were also requested to fill a food diary for 4 days in which type, frequency and quantity as well as cooking method was entered. All this data was entered into Dietist XP software to obtain mean caloric intake.^[12]

The personnel performing the examinations were not aware about the group, the patient would fall into. Reduction in the mean caloric intake, reduction in body weight by 5%, moderate intensity of physical

activity of at least 30 minutes/ day were defined as primary outcomes. Decrease in systolic, diastolic blood pressure, plasma triglyceride levels, LDL cholesterol levels and increase in HDL cholesterol levels were taken as secondary outcomes. Group I (Intervention) were taught about cooking for 1-2 weeks, negative perception about diseases were cleared. Education regarding diabetes, cardiovascular diseases was imparted and patients were encouraged to be physically more active. Group II (control) was treated in the usual manner. Follow up was done at an interval of 1 month and 3 months. The amount of change that occurred in the respective categories was noted. The results thus obtained were arranged in a tabulated for and SPSS software was used for analysis. The results are expressed as mean +/- Standard deviation. Independent sample t test was used for comparison.

RESULTS

A total of 1074 participants were enrolled in the study. Around 20 patients were detected diabetes that were excluded from the study and 15 candidates dropped in between. Out of these 520 candidates were included in Group I and 519 candidates in Group II. Age, sex and height were similar amongst both the groups showing no significant difference. The baseline values of mean body weight and BMI were higher in intervention group compared to control group. Mean systolic blood pressure, diastolic blood pressure, fasting blood sugar level were higher in control group compared to intervention group. But the difference between these values was not significant amongst the groups. Follow up period was 3 months in both the groups.

Table 1: Compiled data of the study.

Variables	Group I (n = 520)		Group II (n=519)		P value
	baseline	change	baseline	change	
Age (years)	47.8 +/- 2.4	-	46.2 +/-1.9	-	>0.05
Male sex, n (%)	409 (78.6)	-	316 (60.8)	-	>0.05
Family history of diabetes n (%)	360 (69.2)	-	379(72.2)	-	>0.05
Education <HS n (%)	105 (20.2)	-	116(22.3)	-	>0.05
Unemployment n (%)	277 (53.2)	-	290(56)	-	>0.05
Smoking n (%)	84 (16.1)	1	94 (18.1)	0	>0.05
Physical activity (hours/ week)	8.5 +/-1.3	37.5 +/- 8.2	12.4 +/-7.9	12.3 +/- 5.1	<0.05
Mean caloric intake (kcal)	1896.5 +/-17.2	-0.54 +/- 0.23	2053.1 +/-13.4	0.23 +/-0.3	>0.05
Body weight (kg)	86.1 +/-11.6	-0.76 +/- 0.44	82.2 +/-12.2	0.46 +/- 0.6	>0.05
Body mass index (kg/m ²)	35.2 +/-3.2	-0.21 +/- 0.1	28.4 +/- 1.8	0.17 +/- 0.2	>0.05
Systolic blood pressure (mmHg)	122.3 +/-11.6	-0.54 +/- 0.34	126.1 +/-12.8	0.64 +/-0.2	>0.05
Diastolic blood pressure (mm Hg)	78.3 +/-11.5	-0.33 +/-0.8	79.3 +/-10.04	0.14 +/-0.3	>0.05
Fasting glucose (mmol/L)	5.6 +/-2.1	0.05 +/-0.01	5.7 +/-1.5	0.15 +/-0.5	>0.05
2-h glucose (mmol/L)	6.28 +/- 2.3	-0.02 +/-0.01	6.25 +/- 1.8	0.11 +/-0.13	>0.05
Triglycerides (mmol/L)	1.53 +/- 0.22	0.16 +/-0.10	1.56 +/-0.87	0.20 +/-0.09	>0.05
LDL-cholesterol (mmol/L)	3.43 +/-1.2	-0.22 +/-0.11	3.35 +/-1.34	0.05 +/-0.03	>0.05
HDL-cholesterol (mmol/L)	1.59 +/-0.9	0.08 +/-0.02	1.89 +/- 0.44	0.01 +/- 0.02	>0.05
Follow-up time (months)	3	-	3	-	-

During the period of follow up, both the groups demonstrated an increase in physical activity but the

change was more significant in intervention group compared to control group. The intervention group

demonstrated a change by 37.5 +/- 8.2 hours/ week compared to 12.3 +/- 5.1 hours/week. The BMI amongst the intervention group demonstrated a mean decrease by 0.21 +/- 0.1 whereas the control group showed an increase by 0.17 +/- 0.2. The difference was not significant between the groups. Systolic blood pressure, body weight showed a decrease of 0.54 +/- 0.34 and 0.76 +/- 0.44 respectively in the intervention group whereas these values increased in control group. Level of HDL cholesterol increased amongst both control and intervention group but increase was more in intervention group. The change was not significant amongst the groups. Only one person in the intervention group quit smoking during the follow up period. The mean caloric intake showed a decrease of 0.54 +/- 0.23 in the intervention group. [Table 1] shows the compiled data related to the study.

DISCUSSION

Lifestyle factors have a great influence on body's function; this fact is well acknowledged by the physicians. Various studies have been conducted in the past linking cardiovascular disease, diabetes to lifestyle interventions. These have contributed a lot in non pharmacological ways of controlling the disease. Diet, physical activity, smoking and psychosocial stress are amongst the top rankers influencing the risk of diseases. In diet, lipid and lipoprotein level influence greatly.^[13-15] According to our study, physical activity, dietary alterations influence the risk of occurrence of diabetes.

A similar study was conducted in United States, reporting the benefits of physical activity and dietary habits.^[16] In our study only a modest change in body weight was seen. The study conducted by United States showed a change of 5.2 kg. This may be due to longer follow up period in their study (24 weeks) compared to 12 weeks in our study. A randomised study on Middle Eastern community pertaining to general population irrespective of risk profile reported a weight gain in both control and intervention group.^[17] In a study including 17 candidates, it was found that lifestyle intervention focussing on physical activity were associated with improvements in level of HbA1c and BMI.^[18]

Various behavioural techniques such as yoga and meditation have also been known to decrease the cardiovascular risk factors.^[19] According to our study, intervention in exercise and diet component lead to an improvement in systolic and diastolic blood pressure but a study by Schellenberg ES et al, these factors exert no influence on blood pressure.^[20]

There are few limitations associated with the present study i.e. the dropout rate. Around 15 candidates quit the study in between. The follow up period of our study was also less i.e. only 3 months which could be the reason for less significant results reported in the study.

CONCLUSION

The study indicates that alterations in lifestyle can reduce the occurrence of diabetes in the population. The study provides an insight into the challenges that can be faced on implementation of lifestyle intervention in controlling the disease.

REFERENCES

- Centers for Disease Control and Prevention. National Diabetes Statistics Report: Estimates of Diabetes and Its Burden in the United States, 2014.
- Lloyd-Jones D, Adams R, Carnethon M, De Simone G, Ferguson TB, Flegal K, et al. Heart disease and stroke statistics–2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*. 2009;119:e21-181.
- Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346:393-403.
- Pan XR, Li GW, Hu YH, Wang JX, Yang WY, An ZX et al. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study. *Diabetes Care*. 1997;20:537-44.
- Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med*. 2001;344:1343-50.
- Boule NG, Haddad E, Kenny GP, Wells GA, Sigal RJ. Effects of exercise on glycemic control and body mass in type 2 diabetes mellitus: a meta-analysis of controlled clinical trials. *JAMA*. 2001;286:1218–27.
- American Diabetes A. Standards of medical care in diabetes–2013. *Diabetes Care*. 2013;36(Suppl. 1):S11–66.
- Johnson M, Jones R, Freeman C, Woods HB, Gillett M, Goyder E et al. Can diabetes prevention programmes be translated effectively into real-world settings and still deliver improved outcomes? A synthesis of evidence. *Diabet Med*. 2013; 30:3-15.
- Saha S, Leijon M, Gerdtam U, Sundquist K, Sundquist J, Arvidsson D, et al. A culturally adapted lifestyle intervention addressing a middle eastern immigrant population at risk of diabetes, the MEDIM (impact of migration and ethnicity on diabetes in Malmö): study protocol for a randomized controlled trial. *Trials*. 2013;14:279.
- von Schenck H, Falkensson M, Lundberg B. Evaluation of "HemoCue," a new device for determining hemoglobin. *Clin Chem*. 1986;32(3):526–9.
- Friedewald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. *Clin Chem*. 1972; 18(6):499–502.
- Diet and nutrition data computer programs for nutrition calculation [cited 2015].
- SACKS FM, Rosner B, Kass EH. Blood pressure in vegetarians. *American journal of epidemiology*. 1974 Nov 1;100(5):390-8.
- Sacks FM, Castelli WP, Donner A, Kass EH. Plasma lipids and lipoproteins in vegetarians and controls. *New England Journal of Medicine*. 1975 May 29;292(22):1148-51.
- Shekelle RB, Shryock AM, Paul O, Lepper M, Stamler J, Liu S, Raynor Jr WJ. Diet, serum cholesterol, and death from coronary heart disease. *N Engl J Med*. 1981 Jan 8; 1981(304):65-70.
- Jaber LA, Pinelli NR, Brown MB, Funnell MM, Anderson R, Hammad A, et al. Feasibility of group lifestyle intervention for

- diabetes prevention in Arab Americans. *Diabetes Res Clin Pract* 2011;91(3):307–15.
17. Harati H, Hadaegh F, Momenan AA, Ghanei L, Bozorgmanesh MR, Ghanbarian A, et al. Reduction in incidence of Type 2 diabetes by lifestyle intervention in a middle eastern community. *Am J Prev Med*. 2010;38(6):628–636.e1.
 18. Avery L, Flynn D, van Wersch A, Sniehotta FF, Trenell MI. Changing physical activity behavior in type 2 diabetes: a systematic review and meta-analysis of behavioural interventions. *Diabetes Care*. 2012;35:2681–9.
 19. Kumar A. Effect of Lifestyle Changes on Glucose Tolerance And Insulin Sensitivity. *Diabetologia Croatica*. 2002;31(1):31–49.
 20. Schellenberg ES, Dryden DM, Vandermeer B, Ha C, Korownyk C. Lifestyle interventions for patients with and at risk for type 2 diabetes: a systematic review and meta-analysis. *Ann Intern Med*. 2013;159:543–51

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