



A study on the effectiveness of Diet and Physical Activity in Diabetes Mellitus patients attending in a clinic in Thiruvananthapuram, Kerala

Authors

Mrs. Jeffy Binu¹, Dr V.Balu², Dr Nisanth K³, Dr Vidhu V⁴, Dr.Vincy T.K⁵,
Dr Tinson V Thomas⁶, Dr.Surumi⁷, Dr Sheeja⁸

¹Assistant Professor in statistics, Dept of Community Meicine, AIMSR, Kollam

^{2,4,5,6,7,8}Junior Resident, Dept of Community Medicine, AIMSR, Kollam

³Assistant Professor, Dept of General Medicine, AIMSR, Kollam

Corresponding Author

Dr Nisanth K

Assistant Professor, Dept of General Medicine, Azeezia Institute of Medical Sciences & Research, Kollam,
Kerala, India

Email: hai.nisanth@gmail.com

Abstract

Background: Type 2 diabetes is a serious growing public health burden. In overweight and obese patients, lifestyle modifications, including nutrition therapy, regular physical activity and weight loss, are considered fundamental for the management of type 2 diabetes. The objective of the study is to evaluate the effect of life style intervention that is diet on blood glucose in diabetic patient over a period of 1 month and to find out whether the variables like BMI, Waist circumference, hip circumference, waist-hip ratio, frequency of hypoglycemic events changes due to this intervention.

Methods: The study setting is a diabetic clinic in Thiruvananthapuram. Subjects who were in the age group 40-65 years and who completed at least five years after diagnosed as diabetic mellitus is selected into the study. Subjects under medication like insulin, OHA and both were included. Sample size obtained was 74. Due to drop outs it came to 50. Patient willing to participate screened after obtaining written informed consent. Self care and self records on food items as well as nutrition were emphasized in order to incorporate them into their lifestyle. The data collected analyzed. Student's t test and Chi-square test performed.

Results: The mean age of duration of diabetes among subjects was 10.44 with a standard deviation 5.388. Average duration of years with type 2 diabetes is more for males than females. Adherence to physical activity (62%) is more than dietary adherence (46%). The intervention for one month is found to be effective as in the study we got significant difference in BMI, FBS and PPBS values. The occurrence of hypo events was also found to be effective after intervention.

Conclusion: The intervention was for one month. There is significant difference in BMI, FBS and PPBS values after intervention, which shows that if the DM patients strictly adhere to Diet and Physical activity improvement can be seen in outcome variables right from first month onwards.

Keywords: Diabetes, Diet, Physical activity.

Introduction

The prevalence of diabetes mellitus, especially type 2 diabetes mellitus (T2DM) is increasing worldwide. As per the International Diabetes Federation (IDF), 366 million people had diabetes in 2011, a number that is estimated to rise to 552 million by 2030. This epidemic will affect developing countries disproportionately as 80 per cent of people with diabetes reside in low- and middle-income countries. Currently, India is 2nd only to China in the total number of people living with diabetes. In 2011, 61.3 million Indians were projected to have diabetes, a number that is expected to rise to 101.2 million in 2030. If unchecked, this epidemic will not only affect the health and well-being of our population but can also impact our economy. The majority of people with diabetes are between 40-59 yr of age⁽¹⁾.

Type 2 diabetes is a serious growing public health burden in the United Arab Emirates (UAE) and is considered a major contributor to mortality and morbidity rates. The International Diabetes Federation (IDF) had estimated 803,900 people living with diabetes in UAE in 2014 and reported it one of the highest prevalence in the Middle East and North Africa region (MENA), highlighting the need for interventions to manage diabetes, prevent its complications and reduce its associated economic burden. In overweight and obese patients, lifestyle modifications, including nutrition therapy, regular physical activity and weight loss, are considered fundamental for the management of type 2 diabetes. However, compliance with healthy lifestyle practices in real life has been found to be a great challenge in Emirati patients with type 2 diabetes⁽²⁾.

Type 2 diabetes mellitus is a metabolic disorder associated with elevations in blood glucose as well as other important risk factors such as blood pressure, cholesterol, and coagulation. The prevalence of this condition is high and it continues to climb, as a result of an aging population and rising obesity rates across the world. In fact, it is predicted that the global

prevalence of diabetes will increase by 65% over the next 20 years⁽³⁾.

Rising prevalence rates are a major concern for governments and health-insurance providers because patients with type 2 diabetes suffer from multiple co morbid conditions in far greater numbers than those without⁽³⁾.

Type 2 diabetes mellitus (DM) is a global problem with devastating human, social and economic impact and fast turning into an epidemic even in the developing countries. Today more than 240 million people worldwide are living with diabetes. Each year 7 million more people develop diabetes. India is one of the rapidly developing countries of the world. The rapid urbanization has brought along with it a sedentary lifestyle, which is an important contributor for diabetes. And hence, India has the second highest diabetes prevalence in the world. Though primary prevention should be the target, the burden of DM should be reduced too. The important principles in the management of diabetes mellitus are drugs, diet and exercise⁽⁴⁾.

Lifestyle modification, in particular recommendations to follow an appropriate dietary pattern, has generally been accepted as a cornerstone of treatment for people with type 2 diabetes, with the expectation that an appropriate intake of energy and nutrients will improve glyceimic control and reduce the risk of complications. However, adherence to healthy lifestyle changes is difficult for many people, and taking tablets is often an easier option. Before the introduction of oral hypoglycemic agents, diet and, for a few, insulin were the only available treatments. During the 1970s the types of diets prescribed and the degree of adherence varied widely⁽⁵⁾.

The results of various follow-up studies have revealed that the proper diet combined with physical exercise are not only useful in preventing type-2 diabetes mellitus and improving disease status but are also effective in the prevention and treatment of all other insulin resistance- related diseases (lifestyle-related diseases), including hypertension and hyperlipidemia, by improving *in vivo* sensitivity to insulin⁽⁶⁾.

Nutrition therapy can reduce glycated hemoglobin (A1c) by 1%–2%, improve serum cholesterol levels and facilitate weight management. Despite these benefits, diabetic patients find it difficult to integrate a dietary pattern consistent with the recommendations into their lifestyle. Thus, not surprisingly, type 2 diabetes (T2D) patients have poor adherence to dietary recommendations. Personal factors that may be barriers to adherence include language and communication skills, lack of knowledge or motivation, taste preferences and cravings, cooking skills, and lack of family and social support⁽⁷⁾.

Rapid socioeconomic development, urbanization, globalization, and an expanding number of fast food outlets, leading to unusual consumption and over dependence, may be contributing to factors influencing adherence to lifestyle modification recommendations amongst type 2 diabetes mellitus patients. Since management of the disorder of diabetes mellitus creates a great physical, psychological and socioeconomic burden on the family and the society, priority should be given on the preventive aspects of disorders with diet and lifestyle modifications⁽⁸⁾.

The state of Kerala in India has high literacy (90.9%) and is the most advanced in terms of demographic and epidemiological transition, with the largest proportion of elderly and those suffering from NCDs, including diabetes. However, as is the case in most of India, the majority (76%) of Kerala's 33 million inhabitants reside in non-urban areas. These factors make rural Kerala an ideal setting in which to trial and develop new approaches to T2DM prevention as suggested that the rest of India is likely to become like Kerala in the future. In other words, interventions developed and evaluated in Kerala have the potential to be adopted elsewhere in India in the future⁽⁹⁾.

Methods

The objective of the study is to evaluate the effect of life style intervention that is diet and physical activity on blood glucose in diabetic patient over a period of 1 month and to find out whether the

variables like BMI, Waist circumference, hip circumference, waist-hip ratio, frequency of hypoglycemic events changes due to this intervention. The study was pre-post study entitled diet and physical activity for the diabetic patients. The study setting is a diabetic clinic in Thiruvananthapuram. Subjects who were in the age group 40-65 years and who completed at least five years after diagnosed as diabetic mellitus is selected into the study. Subjects under medication like insulin, OHA and both were included; subjects who regularly attended outpatient clinic and who were not undergoing any other intervention at present were included.

The sample size was calculated using the formula and obtained as 74. Due to some reason we had 24 drop outs and therefore we continued our study with 50 patients. Prior to the study ethics committee approval was obtained from the institution. Patient willing to participate screened after obtaining written informed consent. Each subjects had two individual sessions with the dietitian, one which is a face to face consultation session before the start of the study and second after one week from the start of the study to reinforce the dietary advice and to give additional support as deemed necessary by the dietitian. A printed form of menu was given by the dietician in whom they are having the details of physical activity which they need to do. On an average at the completion of the study a single patient had 2 to 3 visits. Self care and self records on food items as well as nutrition were emphasized in order to incorporate them into their lifestyle. The emphasis was given on physical activity by asking the duration which they have walked or jogged in each day. The data collected were coded, tabulated and entered in MS Excel and analyzed using R software (EZR Version 1.32)

The outcome measures were HbA1c, Weight, Height, BMI, Waist Circumference, Hip Circumference, Waist Hip ratio, Lipid profile, hypoglycemic events and fasting plasma glucose. Measurements were made at baseline and at the end of one month. Demographic data were

recorded at baseline; a nurse administered a questionnaire on medical history and drugs. Baseline data are reported as Mean \pm SD or proportions as appropriate. Outcome analysis was performed for those with complete data at baseline and post intervention. Differences between baseline and post intervention measures were assessed and are reported as the mean difference between baseline and post intervention values with 95% Confidence interval. Pre-Post differences were assessed by paired Student's t test.

Results

Almost similar number of males (48%) and females (52%) were recruited into the study. 70% of them were having the family history of diabetes. Considering Socio economic status 76% of them were from upper class, 14% were from upper middle, 8% were from middle class, 2% from lower middle, and none of them from lower class. Regarding the types of medication they are following, 18% uses both insulin and OHA, 26% uses insulin and 56% uses OHA alone.

In order to find the association between baseline variables in subjects Chi-square test is applied. No significant association was found between gender and family history ($P=0.902$), gender and socio economic status ($P=0.51$), gender and BMI ($P=0.838$). 56% of them were using oral, 26 % of them were using insulin and 18 % of them were using both oral and insulin medication for diabetes. The mean age of duration of diabetes among subjects was 10.44 with a standard deviation 5.388. Average duration of years with type 2 diabetes is 10.13 for females and for males it is 10.73. Nearly 78% of patients were exposed to diabetes for more than 5 years. 10% of patients were exposed to diabetes for 20 or more years.

The average weight loss for one month was found to be 0.96. The minimum weight loss was 0.31 and maximum was 4.29. 58% (29 out of 50) of subjects had their weight loss less than one, 38% of them between 1.1 and 3 and 4% of them had their weight loss between 3.1 and 5.

Nearly 46% (23 out of 50) is having adherence to diet and 62% (31 out of 50) is having adherence to Physical activity and 46% is having adherence to both diet and physical activity.

When the weight and BMI was compared between males and females during intervention, it has seen that difference in weight between pre and post intervention is more for males than females (Males= 0.7, Females=0.68) and the difference is found to be significant for males (P value=0.00001). BMI was also compared for males and females during intervention and it is found to be significant for both males and females (Males $P=0.00017$, Females $P=0.00110$)

The post intervention values for BMI, FBS, PPBS, WC, HC, WC/HC and hypo events were found to be less among patients.

Pre-post values of the variables like BMI, FBS, PPBS, WC, HC Waist Hip ratio and Hypo events were recorded and their values have been compared. There exist significant difference in their BMI after intervention and it is found to be statistically significant where the $P=0.000$, statistically significant difference was found for FBS after intervention where the P value is 0.000. PPBS were also found to be significantly different after intervention where the P value is 0.000. There exists significant difference in frequency of hypo events after intervention where the P value is 0.000. WC and HC was not found to be significant different after intervention where the P value is 0.362 and 0.239 respectively (Table No.1)

Table No. 1 Effectiveness of intervention on outcome variables

Variables	N	Mean± Standard deviation	95 % of Confidence interval	P value	Interpretation
BMI	50	25.75±2.798	(0.363,0.816)	0.000	Less than 0.0001, Very high Significance
Post BMI	50	25.16±2.655			
FBS	50	141.66±21.766	(2.82, 8.62)	0.000	Very high Significance
Post FBS	50	135.94±20.156			
PPBS	50	207.50±47.156	(8.121, 18.879)	0.000	Very high Significance
Post PPBS	50	194.00±35.348			
WC	50	90.12±7.994	(-0.64, 1.72)	0.362	>0.05, Not Significant
Post WC	50	89.58±8.682			
HC	50	86.35±7.810	(-0.479,1.879)	0.239	>0.05, Not Significant
Post HC	50	85.65±9.42			
Waist Hip ratio	50	1.045±0.042	(-0.011, 0.003)	0.271	>0.05, Not Significant
Post Waist Hip ratio	50	1.048±0.050			
Frequency of Hypo events	50	0.76±0.431	(0.025, 0.255)	0.018	<0.05, Significant
Frequency of Post hypo events	50	0.62±0.490			

Chart No.1 Gender wise difference in weight (Kg)

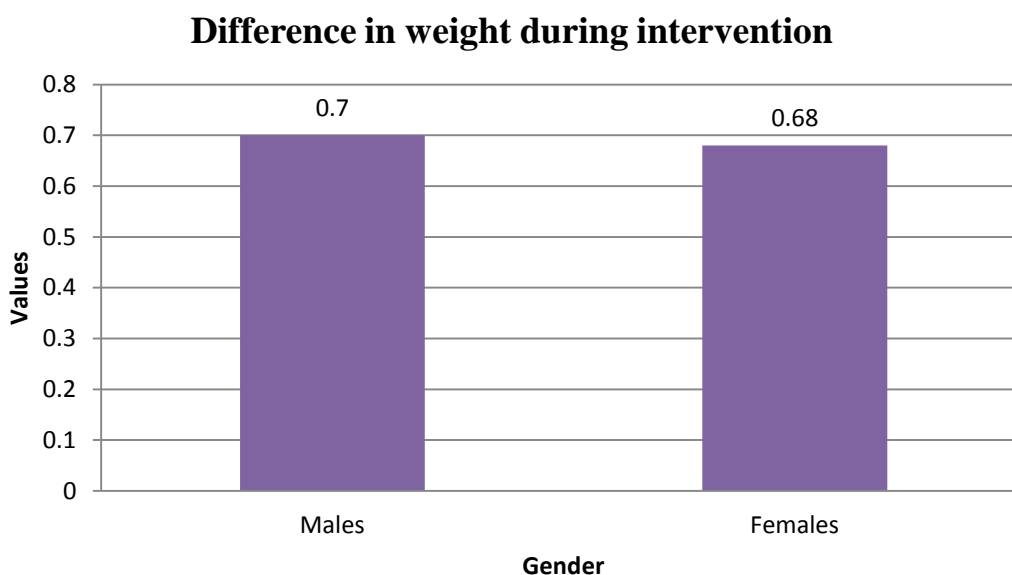
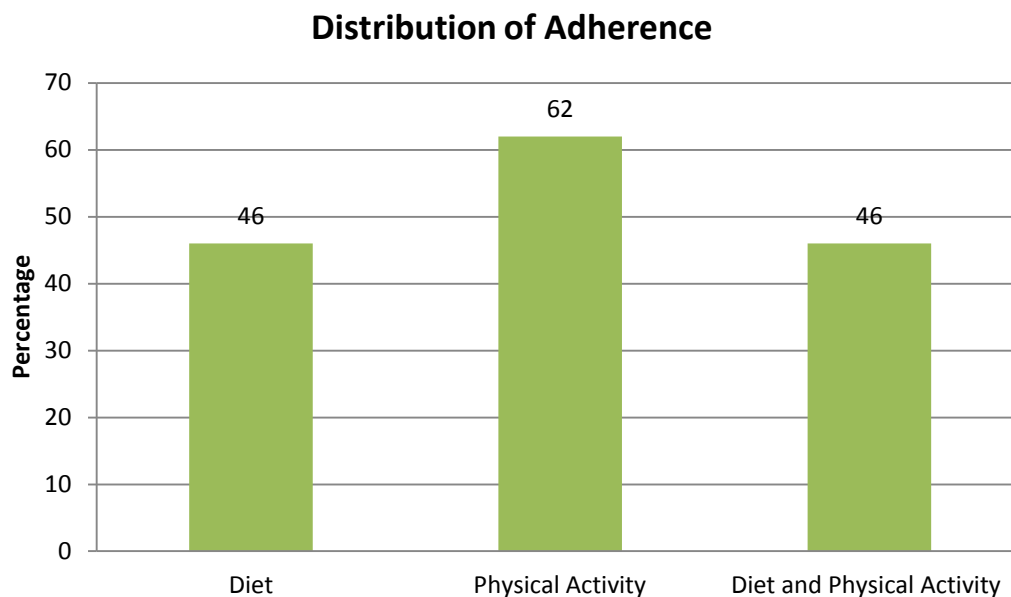


Chart No.2 Adherence of subjects



Discussion

The objective of the study was to find the effect of diet and physical activity in glyceimic control of diabetic patients and to find whether the intervention would remain effective in one month duration in improving certain metabolic and anthropometric outcomes in diabetic patients. The variables which the present study focused on was BMI, FBS, PPBS, Waist circumference, Hip Circumference, Waist Hip Ratio and frequency of Hypoglycemic events. The intervention time was for one month and since the study was done in a Diabetic clinic the adherence of patient to medication, diet and Physical activity was good.

In our study it was found that the non adherence to physical activity is 38%, non adherence to diet is 54% and non adherence to both physical activity and diet is 54%. In a study it was found that non adherence to physical activity is 42.1% and non adherence to diet is 87.5%⁽⁸⁾. The non adherence rate is less in our study compared to the referred study, especially for diet. May be because in the clinic the menu of diet was given and whether the subjects are following it were reinforced by the dietician and proper follow up was done by the study group members. The effect of it is the significant difference we have seen in some of the

outcome variables like weight, FBS and PPBS, even the intervention was for one month.

In the present study 38% of the patients had their weight loss in between 1.1 and 3 kg and 4% of them had their weight loss between 3.1 and 5kg. In a study where the intervention was for 12 months, 38% of persons attained a weight loss of 7⁽¹⁰⁾. In another study it has seen that 12% of persons attained weight loss of 5 % where the intervention was for 12 months⁽¹²⁾. Weight loss is less in our study as our study was for only one month; it has seen that 4% of subjects had their weight loss between 3.1 and 5 kg, which is commendable and which indicates that, if the patients strictly adhere to medication, diet and physical activity, the deduction in weight can be seen right from first month onwards.

In our study it is seen that because of diet and exercise intervention only, the FBS and PPBS value has been decreased. In another study also it was seen that diet and exercise interventions led to a significant decrease in the incidence of DM in that, the study period was for 6 year⁽¹¹⁾. If the persons practice this over months and years, there would be significant decrease in the occurrence of diabetes.

In our study it was seen that the weight is decreased more for men than women and the

difference in weight was found to be significant for men and difference in BMI was significant for both men and women. In another study also it was found that program effect is more for men than women. The weight and BMI had decreased only for men⁽¹²⁾. May be men is more receptive than women and they better adhere to diet and physical activity than women.

In our study four weeks of regress intervention in diet and physical activity in diabetes patients could make a significant decrease in Body Mass Index, FBS, PPBS values and frequency of hypoglycemic events. In a study it was found that eight weeks of standard nutrition and physical activity can decrease BMI, glucose and insulin resistance among DM patients⁽¹³⁾, which shows that if the subjects are strictly following the diet and physical activity as per standard guidelines surely there will be decrease in the outcome variables irrespective of duration of intervention.

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