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Impact of Diet on Glycemic Control in Overweight or Obese Niddm Subjects

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Abstract:
Diet is one of the fundamental therapies for overweight or obese non-insulin dependent diabetes mellitus (NIDDM) individuals to improve their glycemic control and lose weight. Objective: The aim of the study was to determine the effect of diet prescribed at Truweight diet centers on weight loss and glycemic response in the overweight or obese NIDDM individuals. Methods: The study participants (N=55) comprised of 21 males and 34 female overweight or obese NIDDM individuals between the age group of 24-64yrs. The participants were selected from Truweight Hyderabad diet centers using purposive sampling technique. Initial weight, fasting and postprandial blood sugars were collected using standard procedures. After 12 weeks of diet intervention the weight loss, fasting and postprandial blood sugars were recorded for analysis. Data was analyzed by paired t-test, Pearson's correlation, and regression coefficient using SPSS software. Result: In the present study, participants had a significant weight loss of 5.53+2.1 (6%) during the 12 weeks' intervention period. The Mean fasting blood glucose fell from 133 to 101 mg/dl ($p<0.001$). Mean postprandial declined from 181 to 132 mg/dl ($p<0.001$). The weight loss in this study predicts the drop in the postprandial blood sugars significantly ($p<0.022$). The response to the dietary intervention in both males and females was similar. Conclusions: Diet program had led to significant decrease in the initial weight, fasting blood sugar and the postprandial blood sugars in 12 weeks' study period in the NIDDM individuals. The diet program at Truweight made a significant impact on weight loss and glycemic control in both male and females NIDDM individuals.

Keywords: *Obesity, NIDDM, weight loss, Glycemic control*

1. Introduction

Overweight, obesity, type 2 diabetes mellitus (T2DM) and metabolic syndrome are the major health care concerns requiring optimal intervention strategies. The prevalence of obesity and the risk of type 2 diabetes and cardiovascular morbidity are a major health concern in adults. The prevalence of diabetes is rapidly rising all over the globe at an alarming rate (Huizinga and Rothman 2006). Globally, in 2011, 366 million people were identified with diabetes and it is expected to rise to 552 million by 2030. Majority of the people with diabetes lives in developing countries like India, and these countries will also see the greatest increase over the next 19 years (Anjana *et.al*., 2011). In India, Diabetes mellitus is gaining as the status of an epidemic and worldwide, type 2 diabetes, also known as non-insulin-dependent diabetes (NIDDM), accounts for most cases of diabetes mellitus.

Resnick *et al*., (2000) points that obesity and overweight are associated with increased risk of getting diabetes and intentional weight loss reverses the risk of developing diabetes among overweight people. Nutritional intervention has paramount importance in reducing overweight, obesity and thereby preventing diabetes, managing existing diabetes and preventing/slowing diabetic complications. Hence, the present study was taken up with the specific objective to assess the impact of diet on glycemic control in overweight or obese NIDDM individuals.

The objectives of the present study were:

1. To assess the socio - economic background and the nutritional status of the subjects
2. To study the impact of supplementing high fibre and low glycemic index foods to maintain blood sugar levels
3. To assess the impact of weight loss in reducing blood sugar levels

2. Methodology

The present study was carried out by Truweight Wellness Private Limited, Hyderabad. Truweight is a holistic weight loss program which believes "Food is the best medicine". Truweight diabetic program focuses on controlling blood sugars and bringing about weight loss in obese overweight clients by modifying diets with complex carbohydrates, good quality protein, high fibre foods and omega 3 fats. Functional foods like karela, fenugreek, cinnamon, fiber substitutes like psyllium husk, basil seeds are incorporated in the diet for better glycemic control. The total study period of the current work was 12 weeks, during which the clients were subjected to different diabetic and weight loss diets every week.

2.1. Locale and Selection of Subjects of the Study

The location for the present study was Truweight Wellness Centers, Hyderabad. Clients visiting the Truweight wellness clinics formed the subjects of the study. Fifty-five overweight and obese individuals with varied weights and blood sugar levels have formed the subjects for the present study. The subjects of the present study consisted of 21 males and 34 female overweight or obese NIDDM individuals in the age group of 24 to 64yrs. Based on the inclusion and exclusion criteria, subjects were selected using purposive sampling technique. Informed consent was obtained from the subjects before enrolling in the study.

2.1.1. Inclusion Criteria Were

a) Age between 20 - 64 years
b) BMI > 25 kg/m^2
c) Willing to participate and follow the truweight diet program

2.1.2. Exclusion Criteria Were

a) Age < 19 years and > 65 years
b) BMI < 24.9 kg/m^2
c) People with type I diabetes, uncontrolled diabetes, multiple disorders such as hypertension, heart disorders, and cancers
d) People who did not volunteer to participate in the study

2.2. Assessment of the Personal and Socio-Economic Status of the Subjects

Details regarding person characteristics such as age, medical history and socio-economic characters such as age, educational status, occupation, family size, monthly income was elicited using the general questionnaire designed which was pre-tested.

2.3. Assessment of the Nutritional Status of the Subjects

The nutritional status of the subjects was assessed from anthropometric measurements, biochemical estimation, and diet recall.

2.3.1. Anthropometric Measurements

Standardized techniques were used for measuring the height and weight of the clients. The height of the subjects was measured using stature meter and weight using digital weighing balance. The height and weight of all subjects were recorded following the methods of Jelliffee (1966). BMI was calculated using the formula weight in kg / height in m^2.

2.3.2. Biochemical Estimation

Fasting blood sugar (FBS), postprandial blood sugar (PBS) and HbA1C were assessed by standard procedures. The initial and final blood sugar levels and HbA1c were recorded before and after three months of the diet modification.

2.3.3. Dietary Assessment

Dietary pattern of the subjects was assessed on the basis of food intake record (24 hr recall) provided by the subjects during the enrollment of the study. The data collected using 24 hr recall were food and drink consumed, the time the food was eaten, place, description of the food, amount of the food and finally the quantity of the food.

2.4. Truweight Diet Program

Truweight diet program believes in 'treating the system rather than the symptoms'. Truweight focuses on treating the underlying causes of obesity like sleep, stress, nutritional imbalances, gut bacteria and hormonal imbalances. Weekly diet counselling was given to the subjects by dietitians helps to assess and modify the diets. During weekly counselling sessions, the diets were modified based on their clinical condition. The dietitians encouraged and educated the subjects regarding the foods to be consumed for weight loss and managing diabetes. The subjects were given two follow-up calls during each week by the dietitian to discuss the progress with the diet and to clear if there are any doubts concerning the diet. In truweight diet, the subjects were asked to follow 6 meal patterns (3 regular meals and 3 snacks). The subject's diets were modified, simple carbohydrate foods were replaced with complex carbohydrates, sprouted pulses, 3 servings of vegetables as salads, vegetable juice along with pulps (not strained) and one serving of fruit (whole fruit) were incorporated. Daily the subjects were asked to take two teaspoon fenugreek seeds, a gram of cinnamon and 5 gm of fiber supplement.

2.5. Statistical Analysis

After 12 weeks of diet intervention which included complex carbohydrates, low glycemic index, high fiber and moderate protein diets, the weight loss, fasting and postprandial blood sugars were recorded for analysis. The data was coded, and subjected to suitable statistical analysis. Data was analyzed by paired t-test, Pearson's correlation, and regression coefficient using SPSS software.

3. Results and Discussion

3.1. Personal, Socio-Economic and Dietary Characteristics of the Subjects

Assessment of personal and socio-economic characteristics of the subjects revealed that seventy per cent of the subjects (both males as well as females) were graduates following a sedentary lifestyle. The monthly incomes of the subjects were more than Rs. 20,000/- and per month the expenditure for food was above Rs. 5000/-. Around 64 per cent of the subjects had a family history of diabetes. All the subjects enrolled for the present study were under medications with their physicians. Majority of the subjects in the study were found to be suffering from diabetes from past five years or less. Out of 55 clients, 40 percent of the subjects were non-vegetarians. Their diets comprised of simple carbohydrates and processed foods almost every day like biscuits, sweets, cakes, bakery items, fried foods like samosas, kachoris, namkeen. They had very odd meal timings and used to have long gaps in between the meals. Assessment of dietary recall found that, the recommended intake of fibre 40 g/day for healthy adults is not usually met because of low intake of fruits, vegetables, whole and high-fiber grain products, and legumes.

3.2. Nutritional Status of the Subjects

Nutritional status of the subjects was assessed from anthropometric measurements, biochemical parameters and diet recall.

3.2.1. Anthropometric Measurements

Initially, the mean weight of the males was 105.2 kg and that of the females were 80.7 kg. Usually, the subjects enrolling for weight loss in truweight will be above 100 kg for males and above 80 kg for female subjects. That is why in the present study, the mean weight of the subjects was above 105.2 kg for males and 80.7 for females.

3.2.2. Classification of the Subjects Based on the Body Mass Index

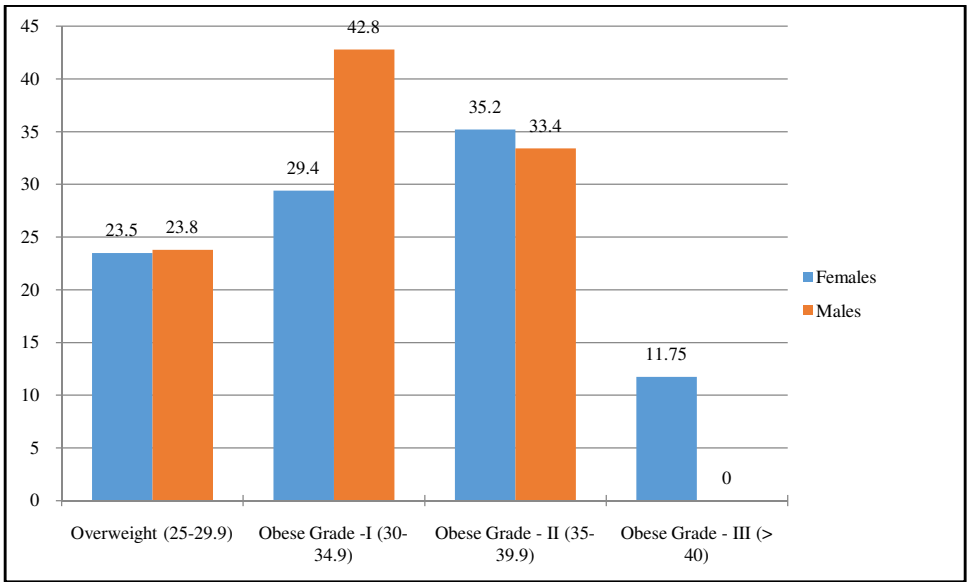

Figure 1: Classification of the subjects based on Body Mass Index

Figure -1 shows the classification of subjects based on Body Mass Index. It can be observed that, 23.8 per cent of the males had BMI between 25 - 29.9 showing that they are in overweight category, 42.8 per cent had BMI between 30 - 34.9 showing that they are in obese grade - I category while 33.3 per cent had BMI ranging between 35-39.9 showing that they are in obese grade - II category. In the case of females, 23.5 per cent had BMI between 25-29.9 showing that they are in overweight category,29.4 per cent had BMI between 30-34.9 showing that they are in obese grade - I category while 35.2 per cent of them had BMI between 35 - 39.9 showing that they are in obese grade - II category and around 11.75 per cent had 40 BMI showing they are in Obese Grade –III. Study by Sharma and Jain (2009) pointed that obesity plays an important role in pathogenesis of T2DM and reported the prevalence of diabetes increases by a factor of 2-3 folds in obese, 5- fold in moderately obese and 10-fold in severe obese individuals' which is in line with the present study.

3.2.3. Biochemical Assessment

The biochemical parameters assessed were fasting blood sugar levels, postprandial blood sugar levels and HbA1C levels. Both the fasting as well as postprandial blood sugars were above normal for both males as well as females in spite of taking medications. Fasting blood sugar levels were 124.6 mg/dl for males and 124.2 mg / dl for females as against the normal 70-100 mg /dl. Considering the postprandial blood sugar levels (normal value was 140-199 mg/dl) the males had a mean of 162.3 mg/dl and for females 157.5 mg/dl respectively.

3.3. Impact of Truweight Diet Modifications on the Subjects after 3 Months

The impact of truweight diet modification on the subjects after 3 months was assessed from changes in body weight, fasting blood sugar levels, postprandial blood sugar levels and HbA1C levels respectively.

3.3.1. Impact of Truweight Diet Modification on the Body Weight of the Subjects after 3 Months

Table –1 show the impact of truweight diet modification on the body weight of the subjects after 3 months

Parameter	Males		Females	
	Initial	Final	Initial	Final
Weight (kg)	105.2	98.7	80.7	75.4

Table 1: Impact of truweight diet modification on the body weight of the subjects after 3 months

Initially, the mean weight of the males was 105.2 kg and that of the females were 80.7 kg. From Table-1, it can be found that, there was significant weight loss for both males as well as females. In the present study participants had a significant weight loss of 5.53±2.1 (6%) during the 12 weeks' intervention period. The present study followed the six meal diet pattern that may cause the glycogen stores to deplete, and therefore the adipose tissues begin to melt for meeting the energy requirements. Thus, it is beneficial for overweight/ obese individuals to reduce their weight as supported by the past study done by Palmer *et al* (2009).

3.3.2. Impact of Truweight Diet Modification on the Fasting Blood Sugar Level and Postprandial Blood Sugar level of the Subjects

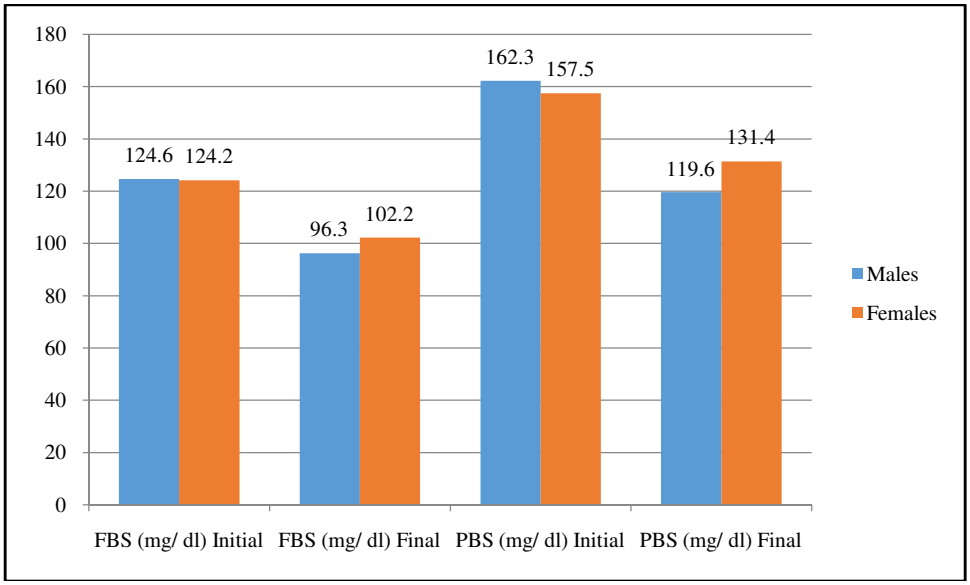

Figure 2: Impact of truweight diet modification on the FBS and PBS of the subjects

From the above figure, it can be inferred that, there was significant reduction in both fasting as well as postprandial blood sugar levels after 12 weeks (3 month) diet program. Initially, the fasting blood sugar level of the males was 124.6 mg/dl after 12 weeks, it has reduced to 96.3 mg/dl and for females it was 124.2 mg/dl and 102.2 mg/ dl respectively. In the case of postprandial blood sugar also there was significant reduction in the levels from the initial to final for both male subjects as well as female subjects. This reduction in blood sugar profiles after 3 month truweight diet program is mainly by fibre supplements and other functional foods as well as whole grain diet with high vegetable intake. The intake of fiber modulates food intake and thereby maintains glucose homeostasis. As per the guidelines of American Diabetes Association (2010), intake of whole fruit, vegetables, low fat dairy products and whole grains, has a beneficial effect on reversing the development of type-2 diabetes, which is in line with the findings of the present study.

3.3.3. Impact of Truweight Diet Modification on Hba1c (N= 14)

Table – II shows the impact of truweight diet modification on HbA1C

Parameters	HbA1C levels (12 weeks)	
	Initial	Final
HbA1C (%)	8.1	6.05

Table 2: Impact of truweight diet modification on HbA1Clevels

The glycosylated hemoglobin test (HbA1C) is considered as an excellent index of long term diabetes control. Blood sugar levels tends to fluctuate daily or sometimes within hours, the HbA1C test forms different as it gives a true index of the average blood glucose

control over the past two to three months. In the present study, 14 subjects underwent the HbA1C test. As seen from the above table, initially the subjects had a mean HbA1C of 8.1 % and after 12 weeks' diet program, it has comedown to 6.05 % which is the normal level.

The mean fasting blood sugar levels fell from 133 to 101 mg/dl ($p<0.001$) and postprandial blood sugar levels declined from 181 to 132 mg/dl ($p<0.001$). The weight loss in this study predicts the drop in the postprandial blood sugars significantly ($p<0.022$).The response to the dietary intervention in both males and females was similar.

4. Summary and Conclusion

In the present study, Trueweight diet program had led to significant decrease in the initial weight, fasting blood sugar, postprandial blood sugar and HbA1C levels during its 12-week study period in the NIDDM overweight or obese individuals. Early diagnosis and dietary management can bring better glycaemic control and postpone chronic complications of diabetes and prolong healthy life. TRUWEIGHT diet program is an important awareness creating approach in the overweight and obese diabetic individuals and can serve as an important tool for reducing weight loss and managing diabetes.

5. Acknowledgement

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6. Conflict of Interest

Nil

7. References

i. American Diabetes Association (2010) Standards of medical care in diabetes. Diabetes Care. 33(suppl 1):S11–61. [PMCID: PMC2797382] [PubMed: 20042772]
ii. Anjana, R.M., Pradeepa, R., Deepa, M., Datta, M., Sudha, V., Unnikrishnan, R., Bhansali, A., Joshi, S.R,, Joshi, P.P., Yajnik, C.S., Dhandhania, V.K., Nath, L.M., Das, A.K., Rao, P.V., Madhu, S.V., Shukla, D.K., Kaur, T., Priya, M., Nirmal, E., Parvathi, S.J., Subhashini, S., Subashini, R., Ali, M.K. and Mohan, V. ICMR–INDIAB Collaborative Study Group. (2011) Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: phase I results of the Indian Council of Medical Research-India Diabetes (ICMR-INDIAB) study. Diabetologia; 54(12):3022-7
iii. Arner, E., Westermark, P.O., Spalding, K. L., Britton, T., Ryden, M. and Frisen, J. (2010) Adipocyte Turnover: Relevance to Human Adipose Tissue Morphology. Diabetes, 59:105-9.
iv. Delzenne, N. M. and Cani, P.D. (2005). A place for dietary fibre in the management of the metabolic syndrome. Curr Opin Clin Nutr Metab Care; 8: 636-40.
v. Huizinga, M. M. and Rothman, R. L. Addressing the diabetes pandemic: A comprehensive approach.(2006) Indian J Med Res.,124 : 481-4
vi. Jelliffe, D. B. (1966). The assessment of the nutritional status of the community. WHO monograph No. 53. Pp: 271
vii. Palmer, M. A., Capra, S. and Baines, S. K. (2009) Association between eating frequency, weight, and health. Nutr Rev.; 67:379-90. doi: 10.1111/j.1753-488
viii. Resnick, H.E., Valsania, P., Halter, J.B. and Lin, X. (2000). Relation of weight gain and weight loss on subsequent diabetes risk in overweight adults. J. Epidemiol Community Health.;54:596-602
ix. Sharma, S and Jain, S (2009). Prevalence of obesity among type 2 diabetics. J. Hum.Ecol., 25(1): 31-35.