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Efficacy of Yoga, Diet and Exercise Based Lifestyle Modification Program on Adjustment of Body Mass Index in Type-I Diabetes Mellitus

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Abstract - In the wake of widespread type-II diabetes as of now, People have become aware that accumulation of body fat and the obesity are the primary causes of diabetes. In spite of dieting and exercise they ever do, it is still failing to keep themselves free from this disease which is instead creeping up almost silently. With a view to give a new impetus to leading a new way of life free from this disease three Yogic Lifestyle modules viz. *Yoga* and Diet-based Lifestyle Modification Program YDLSP, Exercise and Diet-based Lifestyle Modification Program EDLSP and *Yoga*, Diet and Exercise-based Lifestyle Modification Program YDELSP were developed for a wider study with eleven parameters by putting diabetic patients under the intervention of these three modules for 75 days and do a study by measuring their comparative effectiveness. The present study was done by taking Body Mass Index, BMI as the only one parameter to compare the efficacy between yoga and Diet- based Lifestyle Modification program YDLSP and Yoga ,Diet and Exercise - based Lifestyle modification program YDELSP on making adjustment of BMI towards a normal level during the same period . 60 female diabetic subjects within the age range of 30-60 years were selected by means of random sampling from three private clinics within the jurisdiction of Ajmer, Rajasthan, India. The patient status was identified by the doctors concerned as exclusive of having cardio - vascular problems, retinopathy, end-stage kidney and the liver disease, interfering with diet therapy and exercise. The identified subjects were divided randomly by lot into three groups, each consisting of 20 members in the three mean age groups i.e. 47 ± 8.27 , 51.5 ± 6.43 and 52 ± 6.71 and they were categorized respectively as Group-A, YDLSP, Group-B, EDLSP and Group-C ,YDELSP. In the present study the BMI adjustment efficacy of YDELSP was compared with that of YDLSP. The module YDELSP scored 22.22 percent by reducing the initial BMI of 27.00 ± 3.54 to 21 ± 1.23 after the intervention period while YDLSP scored only 7.66 percent by reducing the initial scale of 24.8 ± 1.75 to 22.9 ± 1.64 during the same period. It was found that Yoga, Diet and Exercise-based Lifestyle modification Program YDELSP was more efficacious than Yoga and Diet-based Lifestyle modification Program YDLSP on adjustment the Body Mass Index of type-II female diabetes patients to a healthy normal level within 75 days.

Keywords - "BMI Adjustment", "Body fat", Exercise, "Fatty diet", "Intervention program", "Lifestyle modification modules", obesity, *Yogasanas*.

I. INTRODUCTION

Diabetes mellitus is a disorder of carbohydrate metabolism in which sugars in the body are not oxidized to produce energy due to lack of pancreatic hormone insulin. Accumulation of sugar leads to its appearance in the blood (hyperglycaemia), then in the urine, symptoms include thirst, loss of weight and the excessive production of urine.[Oxford Concise Medical Dictionary,2010].

Diabetes is a group of chronic diseases characterized by hyperglycaemia. Type-I diabetes previously known as insulin-dependent or childhood onset diabetes is characterized by a lack of insulin production. Type-II diabetes (formerly called non-insulin dependent/adult-onset diabetes) is caused by the ineffective use of insulin. It often results from excessive body weight and physical inactivity. Gestational diabetes is hyperglycaemia that is first recognized during pregnancy.[Michael J.Fowler and WHO,2015].

The world prevalence of diabetes among adult, (20-79 years) was estimated to be affecting 281 million adults in 2010, and will increase to 439 million adults by 2030[Epidemiology Baker IDI]. In India diabetes is fast gaining the status of a potential epidemic with more than 62 million diabetic individuals currently diagnosed with the disease. This changing level of diabetes in India is due to the steady migration of people from rural to urban areas, the economy boom and corresponding change of lifestyle.[Joshi SR. 2007, Kumar A et al. 2013, National centre for biotechnology Information U.S.A]

One of the important factors that causes and aggravates diabetes is stress that is caused by erratic lifestyle. Blood glucose needs to go up whenever there is stress to supply the extra energy that is necessary for highly increased danger.[Shrikanta S, et al. 2014].

Yogasanas bring about deep rest to the different parts of the body. This brings deep rest to the pancreas when used in special technique for diabetes mellitus. They either stretch, compress or twist the abdominal areas so that you may bring your awareness to the pancreatic areas, focus and then defocus to keep very deep rest to the pancreas.[Srikanta S et al. 2008]. Yoga can be a powerful additional tool for enhancing conventional diabetes treatment. It makes diet control and weight reduction easier, and is a good form of exercise. It reduces stress hormone levels, improves the function of the pancreas, and normalizes your immune system. In type-II diabetes yoga may eliminate your need to take insulin or drugs.[R Nagarathna et al. 1990].

Although exercise may create significant problems in the blood glucose regulation in insulin treated patients it plays an important therapeutic roles in the management of type-II diabetes mellitus and is often prescribed along with diet and oral anti-diabetic agent for its purpose.[Lawrence R.H 1966].

In the strictest sense lifestyle means the typical ways a person goes about daily living. It not only involves wealth and career but also covers such things as habits, family status and more. A lifestyle disease is a disease associated with the way a person or group of person's lives. A lifestyle disease includes atherosclerosis (thickening of blood vessel), heart disease and stroke, obesity and type-II diabetes. No matter what a person's lifestyle happens to be, there are ways to improve upon troublesome areas. [Megalith Lifestyle.com 2011, Webster's New World Medical dictionary 2012]

If you are overweight and even if everything you eat is fat-free or low in fat, you will not lose weight if you consume more calories than you burn. Also it is biologically plausible that high-fat diets promote weight gain, which then promotes insulin resistance. In addition, there is growing evidence that

obesity plays a central pathogenic role in the development of diabetes.[The diabetes prevention program: HHS News August 6 2001, ©2015 Diabetes Care Services].

Insulin is the key that unlocks the doors for glucose to enter into our muscles. Most people with high blood glucose, pre-diabetes, and diabetes have enough insulin in their bodies, but it does not work. Because, fat in the blood stream can build up inside the muscle cell and create toxic fatty breakdown products and free radicals that can block insulin signaling process. When that happens no matter how much insulin we have in our blood it won't be able to open the glucose gap. That causes the sugar level to build up in the blood. This is called insulin resistance.[Nutritionfacts org, Michael Greger].

With a total of 3500 calories a modern American diet consists of hot dogs, cokes, cornflakes, Oreo cookies, cheese, whiz and Cresco. In the new trend dieting is catching up among the affluent, even in India. High calories junk foods are shunned. The dairy business of U.S.A is collapsing. The scare of colon cancer has cut down the beef consumption drastically. The vegetarian fad is spreading fast.[Nagarathna R et al. 2013]. With this background,

Three yogic lifestyle modules viz. Yoga, Diet-based Lifestyle modification Program YDLSP, Exercise and Diet based Lifestyle modification Program EDLSP and Yoga, Diet and Exercise based Lifestyle modification Program YDELSP. Only two modules YDLSP and YDELSP were taken for the present study. Body Mass Index BMI was the only parameter taken, and the efficacy of these two modules on this parameter was compared.

II. MATERIALS & METHODS

60 female diabetes volunteers within the age group ranging from 30-60 years were put under intervention with 11(eleven) parameters viz., Body weight (kg), guna score by 'G' inventory scale (Satvic, Rajasic, Tamasic), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Body Mass Index (BMI), Pulse Rate (PR), Respiratory Rate (RR), Breath Holding Time (BHT), Fasting Blood Sugar (FBS), Post Prandial Blood Sugar (PPBS) and Triceps Skin Fold (TSF). Private clinical labs were used for measurement of blood sugar, i.e. FBS and PPBS after every fifteen days of intervention program. Other parametric measurements viz., Body weight, guna score, SBP, DBP, BMI, PR, RR, BHT and TSF were done regularly every fifteen days. Aerobic exercise was put to practice twice a week under the supervision of an expert and yoga practices consisting of *Yoga Asanas*, *Pranayama*, Relaxation Techniques, and Meditation were done under the supervision of the author.

Selection of 60 subjects was done on multistage random sampling within the age range of 30-60 years out of 85 volunteers from three private clinics. The patients' status was identified as exclusive of cardio-vascular problem, retinopathy, end-stage kidney and liver disease interfering with diet therapy and exercise by the doctors concerned. Those 85 volunteers were assembled to form them up randomly into three strata of age groups each consisting of 20 subjects and put them under three different intervention modules.

This was done by lots drawn from a common container and put each lot into each of the three slit boxes relevant to the subjects in three age groups under their respective intervention modules till each box got 20 lots. The intervention modules allotted to age-group subjects are indicated below:

Yoga and Diet based lifestyle modification program YDLSP—30-40 years of age.

Exercise and Diet based lifestyle modification program EDLSP—41-50 years of age.

Yoga, Diet and exercise based lifestyle modification program YDELSP—51-60 years of age.

The age group average \pm SD for the above three groups' viz., YDLSP, EDLSP and YDELSP were calculated as 47.6 ± 8.27 , 51.5 ± 6.45 and 52 ± 6.71 , and they were categorized respectively as groupA, YDLSP, groupB, EDLSP and groupC, YDELSP. Anthropometric assessment was done according to Jelliffe 1966, weight in kg and Height in cm were measured. BMI was calculated according to the following formula, Quetelet, 1830-1850: $BMI = \text{weight in kg} / \text{Height in m}^2$. The BMI is an attempt to quantify the amount of tissue mass, muscle, fat and bone in an individual and then categorize that person as underweight, normal weight, overweight or obese based on that value. Accepted BMI are underweight: under 18.5, normal weight: 18.5 to 25, overweight: 25 to 30, obese: over 30.[Malcolm K, 2015 and Eknayan, Garabed, 2007]. Weight was taken wearing light and without shoes, using spring platform balance. Height was measured at the top of the head with the subject's feet on the concrete floor, and without shoes with a scale to the nearest 0.1 cm. TSF was measured with a Triceps Skin-fold Calipers. Blood pressure was measured by sphygmomenometer. Pulse rate was measured while at rest by radial pulse located on the lateral of the wrist, and respiratory rate measured by counting how many times per minute the chest rises. Diabetes veggie diet menu was updated by the Dietician, Department of Food Science and Nutrition, Maharashi Dayanand Saraswati University from the diet chart developed and put to use by Swami Vivekananda yoga Anusandhana Samsthana, Deemed University, Bangalore.

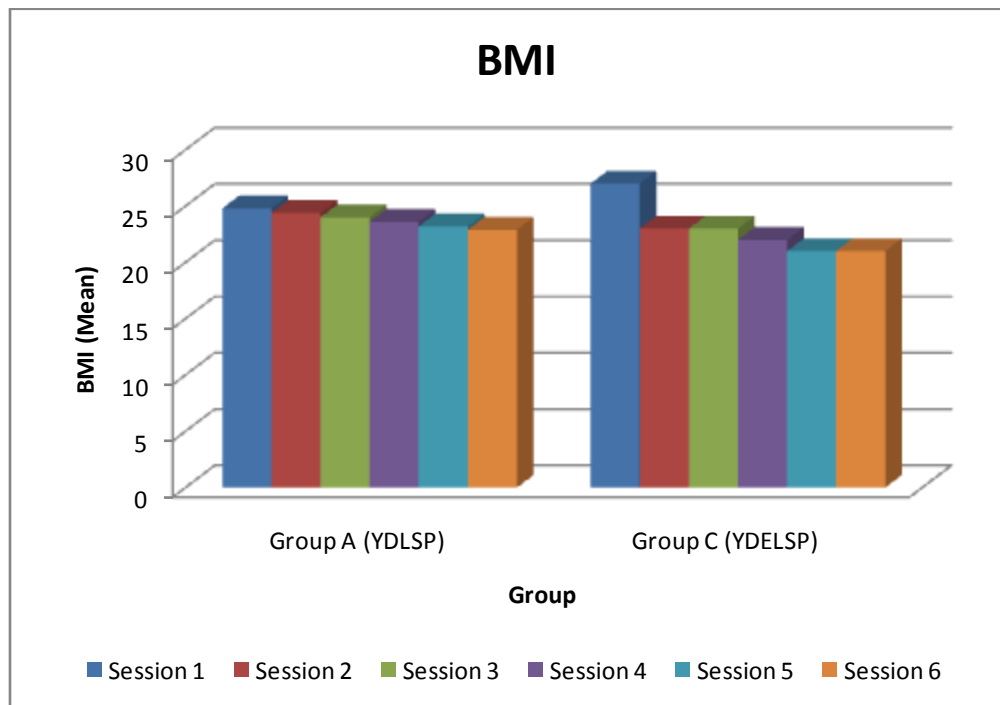
III. RESULT

Module YDLSP of Group A could reduce BMI scale from the initial of 24.8 ± 1.75 to 22.9 ± 1.64 scoring 7.66 percent while module YDELSP of Group C could reduce from 27 ± 3.54 to 21 ± 1.23 scoring 22.22 percent within the intervention of 75 days as shown in table 1 and graph 1 below:

Table-1- Body Mass Index (BMI) and (mean \pm SD)

BMI	Ses-1	Ses-2	Ses-3	Ses-4	Ses-5	Ses-6	% Change (pre & post)
Group A (YDLS P)	24.8 \pm 1.75	24.4 \pm 1.79	24.0 \pm 1.74	23.6 \pm 1.66	23.2 \pm 1.55	22.9 \pm 1.64	7.66
Group C (YDELSP)	27 \pm 3.54	23 \pm 1.72	23 \pm 1.78	22 \pm 1.59	21 \pm 1.74	21 \pm 1.23	22.22

Graph-1- Body Mass Index (BMI) and (mean ± SD)



IV. DISCUSSION

It was interesting to find that Group C diabetic subject under YDELSP joined the session overweight [BMI ≥ 25.00] with a high of BMI 27 ± 3.54 and could reduce it or the low of 21 ± 1.23 [normal BMI range: 18.5-24.99]. This indicated that the diabetic patients under YDELSP was released after the intervention program with an ideal and healthy amount of body fat and tissue which is associated with living longest, and the lowest incidence of serious illness and unhealthy problem. [http/www.askdoweb.com]. It was an encouraging achievement.

V. CONCLUSION AND RECOMMENDATION

The lifestyle module of Yoga, Diet and Exercise based Lifestyle modification Program YDELSF was more efficacious than that of Yoga and Diet based Lifestyle modification Program YDLSP on BMI adjustment of overweight category of female type-II diabetes patients in age group average 52 ± 6.7 to a normal BMI within 75 days of its intervention.

VI. RECOMMENDATION

It is recommended that Yoga, Diet and Exercise based Lifestyle modification Program YDELSF may be used as an effective component of life-style modification program for reduction of BMI of the overweight type-II diabetes patients, not complicated with cardio-vascular problem, end stage kidney, retinopathy and liver disease, interfering with diet therapy and exercise.

It is further recommended that both the exercise and yoga practices should be put into practice on alternate days for six days per week: 2 days for aerobic exercises and 4 days for yoga practices with 1 off-day for rest while using Yoga, Diet and Exercise-based lifestyle modification program for intervention of type-II diabetes, not complicated with cardio-vascular problem, end-stage kidney, retinopathy and liver diseases, interfering with diet therapy and exercise.

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