

Comparative Effects of Yogic Kriyas And Aerobic Programme on Selected Physiological Profile of Diabetic Patients

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Abstract

The purpose of this study was to investigate the Comparative effects of Yogic Kriyas and Aerobic Programme on selected Physiological profiles of Diabetic Patients. For this purpose, a total of 75 Diabetic patients were randomly selected from the list obtained from doctors of bhiwadi district of Rajasthan who were treating diabetic patients. The selected Diabetic patients were suffering with the Non -Insulin Dependent Diabetes. The experimental design was 'Random group Design' in which equal number of subjects i.e. n=25 were assigned randomly to each group. The blood test (fasting blood sugar and postprandial blood sugar) of the patients was done in the pathology lab Star Hospital, Bhiwadi, Rajasthan. On the basis of clinical findings of the Fasting blood sugar and postprandial blood sugar of the patients, it was confirmed that they were the diabetic patient. Statistical Analysis- The Analysis of covariance (ANCOVA) was used as statistical technique. The descriptive statistics i.e. Mean, SD, range was also used for describing the central massing of scores and dispersion of scores of each group. **Results-** It is very clear from the results that 16 weeks of yogic kriyas have significant effect on lowering down fasting and postprandial blood sugar level of diabetic patients. The results of the study have further revealed that aerobic training programme of 16 weeks duration have significantly improved body mass index (BMI) lowered, resting pulse rate and resting respiratory rate. The results have also proved to be effective in lowering down fasting and postprandial blood sugar level of diabetic patients.

Key Words- Diabetes, Aerobics, Insulin, Fasting, Postprandial, Physiological

Introduction

Many diseases are by product of mismanaged lifestyle like obesity, hypertension, and diabetes. The main reason of hypertension and many other diseases may be stress. Every living being is probably living under some or the other stress. This stress is due to varied reasons which are endless and only through the consciousness off right and wrong practice can help us to get rid of stress.

Diabetes is a metabolic syndrome where the pancreas fails to secrete an adequate amount of hormone i.e. insulin or the insulin secreted may be resistant and cannot bring down the sugar levels in the body. Insulin regulates the uptake of glucose from the blood and helps in converting it to glycogen, which is stored in the liver. It is the most extreme general issue of

the endocrine framework, seems to expand glucose levels in the body much of the time remain better than average. Diabetes is an illness that leads either by recognizing the body's failure to make insulin (type 1 diabetes) or by the body not reacting with the impacts of insulin (type 2 diabetes). It can likewise show up during pregnancy. Insulin is one of the primary hormones that manages glucose levels and enables the body to utilize sugar for vitality.

Diabetes is a condition in which excessive amount of urine are excreted from the body daily. Diabetes mellitus is a chronic disorder of the metabolism in which the supply of the hormone insulin is either reduced or completely cut off. Insulin is normally produced by the beta-cells of the pancreas and is then secreted into the bloodstream. In diabetes mellitus, either production of the hormone is diminished or its secretion into the circulation is inhibited. Insulin deficiency affects the metabolism not only of sugar, but also of fat and protein. Without insulin, the cells of the body, particularly muscle and fat cells, are unable to take up sugar from the blood. Regular physical activity exerts a beneficial effect on the clinical picture of diabetes, favoring glucose, FFA and ketone bodies utilization, better capillarization, and improving blood flow and peripheral exchanges. In normal individual, the risk of exercise-associated hyperglycemia is low, as plasma glucose tends to remain constant. In exercising diabetic patients with good metabolic control, plasma glucose will be reduced, and there will be less pronounced increase of ketone bodies, free fatty acids (FFA) etc. Properly prescribed exercise is always an effective adjunct to insulin and diet for the diabetic patients. Exercise facilitates the utilization of glucose level. In essence, exercise itself has an insulin type effect. In addition exercise increases energy expenditure and help the individual to lose weight. Physical activity not only improves the general physical fitness, including cardiovascular performance and muscular strength, but it also has a marked impact on several metabolic parameters such as lipid metabolism and glucose tolerance. Of all the different physical activity programmes available, the aerobic exercise appear to poses the greatest potential for improving our health.

Oxygen consuming wellness is mind boggling part of physical wellness. It includes the association of various physiological procedures in the cardiovascular, respiratory, and strong framework, including the limit, including the limit of lungs to take up oxygen, the limit of the blood in the lungs to get oxygen, the limit of the heart to pump the oxygenated blood to the muscles tissue, and the limit of the tissue to separate the oxygen from the blood and use it to create vitality as ATP through the oxygen framework.

The each aerobic training session must include a warm up and cooling down exercise session in a specific period, warm up gradually prepares the body for vigorous exercise. Without proper warm up, any resting heart, if instantaneously stressed, may show signs of insufficient blood supply. The warm up routine should be focused on easy and slow stretching exercise rather than the strengthening or conditioning exercise, so that one does not begin the aerobic exercise with an oxygen debt. More over stretching helps to prevent injuries and other musculoskeletal problems. Then the tempo of exercise should be gradually increased in the exercise session to adjust the body to higher intensity efforts. The warm up session is recommended as in between 7-20 minutes. And the aerobic exercise should be at least 15-20 minutes continuously. A gradual five minutes cool down period not only help to avoid nausea and cramps, it is also an essential step in exercise routine to avoid more serious problem.

Statement of the Problem

The intention of this study was to analyze the Comparative effects of Yogic Kriyas and Aerobic Programme on selected Physiological profiles of Diabetic Patients.

Procedure**Selection of subjects**

The primary intention of the study was to examine the effects of a well-planned and systematically developed Yogic Kriyas and Aerobic programme of sixteen weeks duration on sugar level of Diabetic patients.

For this purpose, a total 75 Diabetic patients were randomly selected from the list obtained from doctors of bhiwadi who were treating diabetic patients. The selected Diabetic patients were suffering with the Non -Insulin Dependent Diabetes. The subjects were from wide range of age group i.e. between 30 to 60 years of Bhiwadi city of Rajasthan. Out of the sample of 75, there were 30 male subjects and 45 female subjects who were further divided randomly into three groups. Each group consisted of 10 male and 15 female subjects. The three groups were named as experimental group I i.e. Yogic group, experimental group II i.e. aerobic group and the third group was named as control group. The experiment was conducted at Society Diabetic Rehabilitation Centre, Bhiwadi Rajasthan.

Experimental Design of the Study

The experimental design was 'Random group Design'. Equal number of subjects i.e. $n=25$ were assigned randomly to each group. The blood test (fasting blood sugar and postprandial blood sugar) of the patients were done. On the basis of clinical findings of the Fasting blood sugar and postprandial blood sugar of the patients, it was confirmed that they were the diabetic patient. Before starting the treatment, the patients were given the knowledge of benefit of treatment program. The independent variable such as Yogic Practices (Kapalbhati, agnisarKriya and nauli) and Aerobics programme was assigned on the random basis to the groups.

Experimental Treatments**1. Yogic Kriyas Group: -**

Alongside their standard diabetic medicine subjects were given the yogic kriyas comprising of kapalbhati, Agnisarkriya and Nauli for 50 minutes. The Yogic kriyas were performed from Monday through Friday for five days in seven days.

2. Aerobic Programme Group: -

Alongside their normal diabetic drug subjects were furnished with vigorous program for 50 minutes. The program schedule was given from Monday to Friday to five days in seven days. The necessities of the exploratory methods, testing just as oxygen consuming project plans were disclosed to them to fend off any vagueness of the exertion required on their part and before the administration of the examination, the examiner got the individual assent from each subject.

3. Control Group : -

Control group didn't have any experimental treatment but they will follow their scheduled as per their scheduled treatment prescribed by the physicians.

Selection of Criterion Variables

Blood Glucose Estimation was selected on the basis of feasibility of cost and time. The data was collected by administering test blood sugar level of diabetic patients. Before collecting data and starting of training programme, the purpose of the study was explained to all the subjects. The Measurement of blood sugar level was taken at before training programme and after the experimental period of sixteen weeks of duration.

Procedure for Administration of test and collection of data

The data on selected criterion variables was collected by using following standardized procedures: -.

Fasting Blood Glucose

Equipment: Glucometer

Fasting glucose/sugar test means to check level of glucose in the blood in empty stomach. This test was done with the help of glucometer. The glucose in the blood measure in mg/dl, the normal range of fasting glucose in the blood is 70-110mg/dl. The subjects were tested for fasting glucose at 06:00 AM at star hospital Bhiwadi, Rajasthan.

Postprandial Blood Glucose

Equipment: Glucometer

Postprandial Blood glucose test was applied to check glucose level in the blood after two hours of the first proper meal taken by the subjects. This test was also performed with help of glucometer. The glucose in the blood was measured in mg/dl; the normal range of postprandial glucose of human blood is 70-140mg/dl. The subjects were requested to take fall meal after fasting glucose sample was taken in the morning and were asked to report between 08:30 to 09:30 in the hospital for blood sample.

Administration of Training Programmes of 16 weeks duration

The Program structure for Yogic Kriyas for Group A		
S.N	Days	Yogic treatment (6:30a.m-8.00a.m)
1	Monday	Prayer +Basic stretching+anulomavilom pranayama (few rounds)+Kapalbhati: [5 to 10 Round with 100 stroke]+closing with aumkar chanting{5 times}
2	Tuesday	Prayer +Basic stretching+anulomavilom pranayama (few rounds)+Agnisar: [5 to 10 Round with 100 stroke]+closing with aumkar chanting{5 times}
3	Wednesday	Prayer +Basic stretching+anulomavilom pranayama (few rounds)+Nauli: [5 to 10 Round with 100 stroke]+closing with aumkar chanting{5 times}
4	Thursday	Prayer +Basic stretching+anulomavilom pranayama (few

		rounds)+Kapalbhati: [5 to 10 Round with 100 stroke]+closing with aumkar chanting{5 times}
5	Friday	Prayer +Basic stretching+anulomavilom pranayama (few rounds)+Agnisar: [5 to 10 Round with 100 stroke]+closing with aumkar chanting{5 times}

The Load intensity and volume was kept widely flexible so that it remains within the range of every subject's accomplishment. At the end of every week load effect and recovery pattern for all the subjects was evaluated on the basis of subjective responses of each subject. Five to ten percent increase in intensity and volume was made. Each and every kriyas were performed for 5 to 10 repetitions. The subjects were asked to perform Shavasana for relaxation after each set of practice.

**The training Programme of Aerobics Group for experimental Group II is as follows:-
Low Impact (0-8 Week)**

Movement	Repetition	Perceived Exertion	Efforts
Stretching	3	6 to 10	20 to 50%
Step Touch	3	6 to 10	20 to 50%
Side to Side	3	6 to 10	20 to 50%
Walking Front & Back	3	6 to 10	20 to 50%
Jumping-Jack	3	6 to 10	20 to 50%
Kick Step	3	6 to 10	20 to 50%
Long side back	3	6 to 10	20 to 50%
V-Step	3	6 to 10	20 to 50%
Pivots	3	6 to 10	20 to 50%

Moderate Impact (8-12 Week)

Movement	Repetition	Perceived Exertion	Efforts
Running on the spot	5	10-16	50-60%
Jumping Jack	5	10-16	50-60%
Jumping jack with variation	5	10-16	50-60%
Squat Jump	5	10-16	50-60%
Kick Step	5	10-16	50-60%
Skip Jump	5	10-16	50-60%
Lung side and back	5	10-16	50-60%
Jazz Walk	5	10-16	50-60%
Hop	5	10-16	50-60%
Knee Lift	5	10-16	50-60%

High Impact (12-16 Week)

Movement	Repetition	Perceived Exertion	Efforts
Running on the spot	7	16-20	60-75%
Squad Jump	7	16-20	60-75%
Double step touch	7	16-20	60-75%
Kick Step	7	16-20	60-75%
Jumping Jack with variation	7	16-20	60-75%
Kick Side & front	7	16-20	60-75%
Skip Jump	7	16-20	60-75%

Hop	7	16-20	60-75%
Knee Lift	7	16-20	60-75%
Jazz Walk	7	16-20	60-75%

*First two weeks of low intensity aerobic workout was given to the subject after that load was increased according to the capacity of subjects towards medium intensity of load.

Statistical Procedure

As per the statistical technique, the descriptive statistics i.e. Mean, SD, range was also used for describing the central massing of scores and dispersion of scores of each group. Further to find out which training program was more effective on blood sugar level of diabetes patients, the Post Hoc test was used. 0.05% level of significance was set to check the error associated with the results.

Results

The descriptive analysis of Pre and Post Test mean scores of Fasting Blood Sugar levels of diabetic patients among experimental groups and control group due to sixteen weeks of treatment is presented in table 2.

Table – 2

DESCRIPTIVE STATISTICS OF PRE AND POST-TEST MEAN SCORES OF FASTING BLOOD SUGAR LEVEL OF DIABETIC PATIENTS AMONG EXPERIMENTAL GROUPS AND CONTROL GROUP AFTER SIXTEEN WEEKS OF TREATMENT

Time	Group	Test	Mean	SD	Minimum	Maximum	Range
Pre-Prandial	Yogic Group	Pre-test	154.12	9.66	140	177	37
		Post-test	118.56	6.93	108	135	27
Post Prandial		Pre-test	185.92	11.05	167	209	42
		Post-test	145.00	13.30	123	175	52
Pre-Prandial	Aerobic Group	Pre-test	161.92	9.90	144	180	36
		Post-test	138.60	11.63	118	165	47
Post Prandial		Pre-test	200.04	13.10	167	220	53
		Post-test	169.92	12.41	139	188	49
Pre-Prandial	Control Group	Pre-test	155.48	14.13	130	178	48
		Post-test	160.88	13.06	140	180	40
Post Prandial		Pre-test	190.28	15.80	160	212	52
		Post-test	189.92	22.71	162	220	58

The pre and post test scores of control and experimental group in the above table clearly reveals that the maximum range between pre test fasting blood sugar level and post tests fasting blood sugar level was found in control group i.e. 48 & 40 respectively. The second highest range in pre test fasting blood sugar level and post test fasting blood sugar level was found to be in yogic group i.e. 36 & 47 respectively. The lowest range in pre test fasting blood sugar level and post test fasting blood sugar level was found to be in the aerobic group

i.e. 37 & 27 respectively. The mean score in fasting blood sugar level of diabetic patients in yogic group was found to be 154.12 (Pre Test) and 118.56 (Post test) respectively. In the case of aerobic group the mean score of fasting blood sugar level during pre test was found to be 161.92 and post test mean score was 138.60. On the other hand the mean score of fasting blood sugar level of control group in the pre test was found to be 155.48 and post test mean value was found to be 166.88.

The pre and post test scores of control and experimental found that the maximum range between pre-test postprandial blood sugar level and post-test postprandial blood sugar level was found in control group i.e. 52 & 58 respectively. The second highest range in pre-test postprandial blood sugar level and post test postprandial blood sugar level was found to be in aerobic group i.e. 53 & 49 respectively. The lowest range in pre test of postprandial blood sugar level and post test postprandial blood sugar level was found to be in the yogic group i.e. 42 & 52 respectively. The mean scores in postprandial blood sugar level of diabetic patients in yogic group was found to be 185.92 (Pre Test) and 145.00 (Post test) respectively. In the case of aerobic group the mean score of postprandial blood sugar level during pre test was found to be 200.04 and post test mean score was 169.92. On the other hand the mean score of postprandial blood sugar level of control group in the pre test was found to be 190.28 and post test mean value was found to be 189.92.

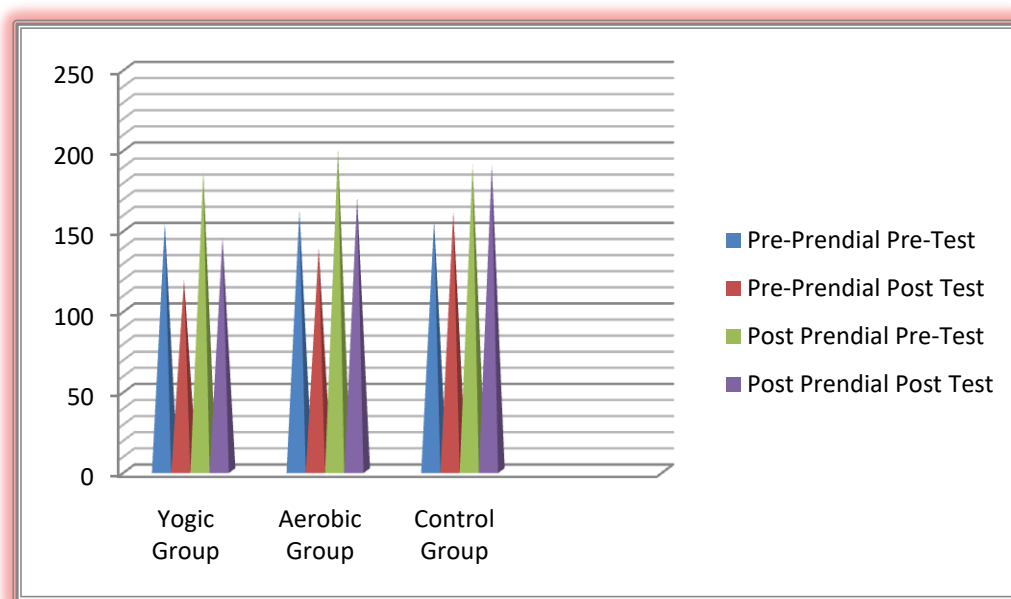


Fig. 1 – The data were placed in the graph which shows pre & post test mean scores of experimental and control group.

The adjusted post test mean scores of fasting blood sugar level for diabetic patients among different treatment group after sixteen week of treatment is presented in table no. 4.

Table 4

ADJUSTED POST TEST MEAN SCORES OF FASTING BLOOD SUGAR LEVEL OF DIABETIC PATIENTS AMONG DIFFERENT TREATMENTS AND CONTROL GROUP AFTER SIXTEEN WEEKS OF TREATMENT

Treatment Groups	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Yogic Group	121.257	0.825	119.613	122.901
Aerobic Group	134.408	0.839	132.736	136.080
Control Group	162.376	0.818	160.745	164.006

The results of table shows that the adjusted post mean scores of Fasting Blood Sugar Level in Yogic Group was 121.257, Aerobic Group was 134.408 and Control Group was 162.376 respectively, after nullifying the effects of initial differences among the Treatment groups. It is evident from the results that 16 weeks of yogic treatment has been found significantly effective in lowering down the Fasting Blood Sugar Level to 121.257 of diabetic patients in comparison to experimental aerobic group and control group. It was found to be significant at 0.05 level of confidence.

Result of ANCOVA.

Table 5

ANCOVA ADJUSTED POST TEST MEAN SCORES IN EXPERIMENTAL AND CONTROL GROUP AFTER SIXTEEN WEEKS OF TREATMENT

Source	Type III Sum of Squares	Df	Mean Square	F
Groups	22046.063	2.00	11023.032	664.599*
Error	1177.604	71.00	16.586	
Total	1487215.000	75.00		

*0.05% level of significant $F_{.05} (2, 72) = 3.13$

The results shows that there are significant effects of sixteen weeks of treatment on Fasting blood sugar level among three groups as the 'F' value is greater than the required.

The Post Hoc test (Pair wise comparison) of mean scores of fasting blood sugar level for diabetic patients among treatment groups and control group after sixteen weeks of treatment is presented in table no. 6.

Table 6

POST HOC COMPARISON OF ADJUSTED POST TEST MEAN SCORES IN FASTING BLOOD SUGAR LEVEL OF DIABETIC PATIENTS AMONG

EXPERIMENTAL GROUPS AND CONTROL GROUP AFTER SIXTEEN WEEKS OF TREATMENT

Yogic group	Aerobic group	Control group	Mean Difference (I-J)	Critical difference at .05 level of significance
121.25	134.40		13.15*	1.19
121.25		162.37	41.11*	1.19
	134.40	162.37	27.97*	1.19

*Significant at 0.05% level with 2 and 72 degree of freedom

The above table clearly shows that Yogic treatment was found to be significantly more effective and better in comparison to aerobic treatment and control group in lowering down the fasting blood sugar level of diabetic patients in comparison to aerobic programme of sixteen weeks of duration, as obtained value of 13.15 and 41.11 were found to be greater than the critical difference value of 1.19 required to be significant at 0.05 level of confidence. Aerobic treatment was found to be significantly better and most effective in lowering down the fasting blood sugar level of diabetic patients in comparison to control group as the obtained value of 27.97 was found to be greater than 1.19 required to be significant at 0.05 level of confidence.

The adjusted post-test mean scores of postprandial blood sugar level for diabetic patients among different treatment group after sixteen week of treatment is presented in table no. 9.

Table 9

ADJUSTED POST TEST MEAN SCORES OF POSTPRANDIL BLOOD SUGAR LEVEL OF DIABETIC PATIENTS AMONG DIFFERENT TREATMENTS AND CONTROL GROUP AFTER SIXTEEN WEEKS OF TREATMENT

Treatment Groups	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Yogic Group	140.950	2.681	144.605	155.296
Aerobic Group	163.523	2.741	158.058	168.988
Control Group	191.367	2.596	186.190	196.544

An examination of Table 9 clearly reveals that the adjusted post mean scores of Postprandial Blood Sugar Level in Yogic Group was 140.95, Aerobic Group was 163.52 and Control Group was 191.36 respectively, after nullifying the effects of initial differences among the Treatment groups;. It is evident from the results that 16 weeks of yogic treatment has been found significantly effective in lowering down the Postprandial Blood Sugar Level to 140.95 of diabetic patients under the experimental 'Yogic Group' in comparison to experimental aerobic group and control group. It was found to be significant at 0.05 level of confidence.

Further, the ANCOVA was used to find out the significance differences between experimental groups & control group after eliminating the effects of covariance. The analysis is presented in table no. 10.

Table 10

ANALYSIS OF COVARIANCE OF ADJUSTED POST TEST MEAN SCORES OF POST PRANDIAL BLOOD SUGAR LEVEL AMONG EXPERIMENTAL GROUPS AND CONTROL GROUP AFTER SIXTEEN WEEKS OF TREATMENT

Source	Type III Sum of Squares	Df	Mean squares	F
Group	22245.001	2.00	11122.501	66.409
Error	11891.340	71.00	167.484	
Totan	2169501.000	75.00		

*Significant at 0.05% level of confidence $F_{.05}(2, 72) = 3.13$

It is clear from the above table that there are significant effects of sixteen weeks of treatment on Postprandial Blood Sugar Level among three groups as the calculated value of 'F' was found to be 66.409 which is significantly greater than the tabulated value of 3.13 at 0.05 level of confidence. It is clear from the analysis that there are significant differences among the means of three groups are due to sixteen weeks of treatment on postprandial blood sugar level of diabetic patients.

The Post Hoc test (Pair wise comparison) of mean scores of Postprandial Blood Sugar level for diabetic patients among treatment groups and control group after sixteen weeks treatment is given in table no. 11.

Table 11

POST HOC COMPARISON OF ADJUSTED POST TEST MEAN SCORES OF POSTPRANDIL BLOOD SUGAR LEVEL OF DIABETIC PATIENTS AMONG EXPERIMENTAL GROUPSAND CONTROL GROUP AFTER SIXTEEN WEEKS OF TREATMENT

Yogic group	Aerobic group	Control group	Mean Difference (I-J)	Critical difference at .05 level of significance
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149.95	163.52	13.57*	3.99
149.95		191.36	41.41*
	163.52	191.36	27.84*
			3.99

*Significant at 0.05% level with 2 and 72 degree of freedom

It is evident from the above results that yogic treatment was found to be significantly more effective and better in comparison to aerobic treatment in lowering down the Postprandial blood sugar level of diabetic patients in comparison to aerobic programme of sixteen weeks of duration, as obtained value of 13.57 was found to be greater than the critical difference value of 3.99 required to be significant at 0.05 level of confidence. It is also evident from the results that aerobic treatment was found to be significantly better and most effective in lowering down the postprandial blood sugar level of diabetic patients in comparison to control group as the obtained value of 27.84 was found to be greater than 3.99 required to be significant at 0.05 level of confidence. It may further concluded that lower Postprandial blood sugar level of a diabetic patients helps in keeping his/her good health and higher Postprandial blood sugar level brings disharmony in the functioning of various system of the body.

Discussion of Findings-

It is very clear from the results that 16 weeks of yogic kriyas have significant effect on lowering down fasting and postprandial blood sugar level of diabetic patients. It is further noticed from the results that yogic kriyas of 16 weeks of duration have better effect on systolic blood pressure, body mass index (BMI), resting pulse rate and resting respiratory rate. The result of the study further reveals that there is no effect of yogic kriyas of 16 weeks of duration on diastolic blood pressure. The results of the study are in consonance with the findings of Manchanda et. al., Chinkodiet. al., Nagasukeertiet. al., Ramesh et. Al, Parthiban et. al., Meena et. al., and Govindrajulu et. al.

Conclusion-

Within the limitations of the present study, the following conclusions may be drawn that that yogic kriyas are better means to controlled fasting and postprandial blood sugar level of diabetic patients. It may be further concluded that aerobic exercises are also beneficial in lowering down fasting and postprandial blood sugar level of diabetic patients. aerobic exercise are more effective than yogic kriyas in optimizing/increasing body mass index (BMI) of diabetic patients.

Work Citation

Aljasir B, Bryson M and Al-Shehri B, "Yoga Practice for the Management of Type II Diabetes Mellitus in Adults: A systematic review" Evidence Based Complementary and

Alternative Medicine, 2010 Dec; 7(4): p-399-408.retrieve from pub med on 12th Nov 2017.

A.K, “ A New Horizon in the Trends and Practices” Cited bt Dr. Singh Ajmer and Dr. Gangopadhyay S.R, Trends and practices in physical education in India, (New Delhi Friends Publication, 1991), p-1.

Charles A. Bucher and William E. Prentic, Fitness for college life, (Philadelphia: The Mosby College Publishing, 1985), PP.287-288.

Charles A., Bucher and William Prentice E., Fitness for college and Life/Toronto: C. V. Mosby Company 1985, p.27.

Clarck H.Harison.”Physical Fitness Research Digest”; 2 (4) : (Washington D.C President Council on Physical Fitness and Sports), Oct. 1972.p.p.159conditions/diabetes/exercise-for-diabetes-control-ga.htm on 3rd June 2015.

Cooper Kenneth H., The Aerobic Way, (London: the Bantan Book Ltd, 1977), PP. 64-67.

Dr. Bennett KingAllenand Dr. Armstrong Dana,“How to Control Diabetes with Exercise” an online article retrieved from [http://health.howstuffworks.com/](http://health.howstuffworks.com/diseases-) diseases-

Dr. Howell Reet, Prof. Maxwell and Dr. Uppal A.K., “Foundation of Physical Education” (New Delhi: Friends Publication, 1994), pp.17-18.

Dr. Robson M., “Health fitness of the Adult Keep Fit and Feel Fit”, Cited by Singh and Gangoopadhyay, Trends and Practices in Physical Education in India, p-85.