



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

*International Journal of Recent Scientific Research*  
Vol. 9, Issue, 10(E), pp. 29431-29433, October, 2018

**International Journal of  
Recent Scientific  
Research**

DOI: 10.24327/IJRSR

## Research Article

### EFFECT OF YOGA ON BLOOD SUGAR STATUS IN DIABETIC PATIENTS

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DOI: <http://dx.doi.org/10.24327/ijrsr.2018.0910.2860>

#### ARTICLE INFO

##### Article History:

Received 15<sup>th</sup> July, 2018  
Received in revised form 7<sup>th</sup>  
August, 2018  
Accepted 13<sup>th</sup> September, 2018  
Published online 28<sup>th</sup> October, 2018

##### Key Words:

Body Mass Index, Diabetes mellitus,  
Blood glucose, yoga

#### ABSTRACT

Diabetes is a chronic metabolic disorder that prevents the body to utilize glucose completely or partially and alteration in carbohydrate, protein and fat metabolism. People are greater risk of diabetes due to improper dietary practice, unhealthy life style, lack of physical exercise. The effect of yoga on blood sugar status of diabetic patient was conducted in 100 samples in both male and females. Statistical analysis showed that significant changes regarding mean blood sugar level was observed in male as well as in females before and after Yoga exercise. Thus, it can be concluded that Yoga exercise affects the blood sugar level in males as well as females. Consumption of high carbohydrates, fat diet was revealed as the major contributing cause of disease in both male and females.

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#### INTRODUCTION

Diabetes mellitus represents a cluster of metabolic diseases characterized by high level of blood glucose (hyperglycemia). This may be as a result of defects in insulin secretion, insulin action or both. Insulin is a hormone secreted by beta cells of langerhans, situated in pancreas. Observational studies addressing physical activity, weight loss, and dietary intake of whole grains and fiber etc. provided evidences for factor that might delay or prevent Type-2 diabetes<sup>1</sup>. Diabetes is a major cause of morbidity and majority in Scotland and worldwide, with an increasing prevalence. In 2009 there were around 2,28,000 people registered as having diabetes in Scotland an increase of 3.6% from the preceding year<sup>9</sup>. People are greater risk of diabetes due to improper dietary practice, unhealthy life style, socioeconomic situation, mental stress and lack of physical exercise<sup>2,3</sup>. Too much fat especially saturated from meat or dairy product contains too much sugars calories, and not enough whole grains, fruits and vegetables are the primary dietary problem challenging the population. The present study was conducted to effect of yoga on blood sugar status in diabetic patients.

#### MATERIAL AND METHODS

The study is carried out in 100 diabetic male and female diabetic subjects from local hospitals from Agra city. Multistage stratified random sampling technique was used in

the selection of samples. In this study relevant information regarding socio-economic profile, dietary pattern etc. From the patient using the predesigned schedules was collected. The study is carried out under the following objectives:

1. To assess the health status through BMI in male and female diabetic patients
2. Effect of yoga on blood sugar status in diabetic patients

Statistical analysis was performed to find out the effect of all factors on diabetes with the help of mean SD, t-test and to see the significance at 5% level. Correlation coefficient was also applied to assess the relationship between blood sugar level and exercise.

#### RESULT AND DISCUSSION

Results and discussion of our study is summarized below:

Table-1 reveals the distribution of male and female respondent according to age. Out of 50 male and female diabetic patients, majority of them (36.00%) were in the age group of 45-55 yrs, followed by 28.00% in the age group of 55-65 yrs and the minimum 40.0% each was in the age group of 35-40 years. Out of the female diabetic patients, majority of them (28.0%) the age group of 65-75 years and 75-85 years respectively..

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**Table 1** Distribution of male and female diabetic patients according to age

Age in Years	Sex of the respondents			
	Male		Female	
	No.	%	No.	%
25-35	0	0.0	5	20.0
35-45	5	20.0	4	16.0
45-55	9	36.0	9	36.0
55-65	7	28.0	7	28.0
65-75	2	8.0	0	0.0
75-85	2	8.0	0	0.0
Total	25	50.0	25	50.0
Mean	54.08		45.84	
SD	10.64		11.18	
t-test	2.669			
p	<0.05			

To assess anthropometric measurement of the selected subject

**Table 2** Distribution of the Male and female respondents according to body mass index

Body Mass Index	Sex of the respondents				Total	
	Male		Female			
	No.	%	No.	%	No.	%
15-20(under weight)	4	16.00	27	54.00	5	10.0
20-25(Normal)	14	56.00	22	44.00	25	50.0
25 and above(over weight)	7	28.00	13	52.00	20	40.0
Total	50	100.00	50	100.00	50	100.0
Mean	22.84		23.51		23.18	
SD	3.77		5.21		4.56	
t-test	0.521					
p	>0.05					

Above table highlights the distribution of Male and female respondents according to body mass index. Out of the 50 male and female diabetic patients, majority of them (50.00%) were having the body mass index of 20 – 25 kg., followed by 40.00% having the body mass index of 25 and above and the minimum (10.00) were having the body mass index of 15-20. Out of the 50 male diabetic patients, majority of them (56.00%) were having the body mass index of 20 – 25 kg., followed by 28.0% having the body mass index of 25 and above and the minimum (1600) were having the body mass index of 15-20. Out of the 50 female diabetic patients, majority of them (52.00%) were having the body mass index of 25 and above followed by 28.0% having the body mass index of 20 – 25 kg., and the minimum (4.0) were having the body mass index of 15-20.

**Table 3** Distribution of the Male and female respondents according to fasting blood sugar level before exercise

Blood sugar level (mg/dl)	Sex of the respondents				Total	
	Male		Female			
	No.	%	No.	%	No.	%
100-110	1	2.0	2	4.0	3	6.0
110-120	0	0.0	4	8.0	4	8.0
120-130	8	16.0	8	16.0	16	32.0
130-140	3	6.0	8	16.0	11	22.0
140-150	7	14.0	1	2.0	8	16.0
150 -160	5	10.0	1	2.0	6	12.0
160-170	1	2.0	1	2.0	2	4.0
Total	25	50.0	25	50.0	50	100.0
Mean	135.04		125.60		130.32	
SD	15.01		12.27		14.50	
t-test	2.435					
p	<0.05					

Further analysis of data from the table shows that the mean of BMI of the diabetic patients was 23.18 which were more among the female diabetic patients (23.51) as compared to male diabetic patients (22.84). Statistically significant difference regarding mean of BMI was observed between male and female diabetic patients ( $t=0.521, >0.05$ ).<sup>5</sup>

Table-4 reveals the distribution of the Male and female respondents according to blood sugar level before exercise. Out of the 50 male and female diabetic patients, majority of them (32.0 %) were having the blood sugar level 120-130,, followed by 22.00% having 130-140 and the minimum (4.00) have fasting blood sugar level of 160-170. Among the male diabetic patients, majority of them (32.00%) were having the blood sugar level 120-130,, followed by 28.00% having 140-150 and the minimum (4.00) have fasting blood sugar level of 100-110 and 160-170. Among the female diabetic patients, majority of them (32.00%) were having the blood sugar level 120-130,, followed by 16.00% having 120-130 and the minimum (4.00) have fasting blood sugar level of 140-150, 150-160 and 160-170. Further analysis of data from the table shows that the mean of fasting blood sugar level of the diabetic patients was 130.32 which were more among the male diabetic patients (135.04) as compared to female diabetic patients (125.60). Statistically significant difference regarding mean of fasting blood sugar level was observed between male and female diabetic patients ( $t=2.435, <0.05$ ) This difference might be occurred due to performing exercise, restricted diet and taking proper medicine

**Table 4** Distribution of the Male and female respondents according to duration of Yoga

Duration of yoga	Diabetic Patients				Total	
	Male		Female			
	No.	%	No.	%	No.	%
1 hour	7	14.0	10	20.0	17	34.0
1/2 Hour	13	26.0	4	8.0	17	34.0
<1/2 Hour	5	10.0	11	22.0	16	32.0
Total	25	50.00	25	50.00	50	100.0

Above table highlights the distribution of Male and female respondents according to duration of yoga. Out of the 50 male and female diabetic patients, majority of them (34.0%) were spend 1 hour per day and 1/2 hour per day in doing yoga, and the minimum (32.00) were spend <1/2 hour per day in doing yoga. Among the male diabetic patients majority of them (52.0%) were spend 1/2 hour per day in doing yoga, and the minimum (20.00) were spend <1/2 hour per day in doing yoga. Among the female diabetic patients majority of them (44.0%) were spend <1/2 hour per day in doing yoga, and the minimum (16.00) were spend 1/2 hour per day in doing yoga.<sup>5,6</sup>

**Table 5** Distribution of the Male and female respondents according to Yoga day

Yoga/day	Diabetic Patients				Total	
	Male		Female			
	No.	%	No.	%	No.	%
1 time	21	42.0	21	42.0	42	84.0
2 time	4	8.0	4	8.0	8	16.0
Total	25	50.00	25	50.00	50	100.0

Above table highlights the distribution of Male and female respondents according to duration of yoga. Out of the 50 male and female diabetic patients, majority of them (84.0%) were yoga 1 time in a day and the minimum (16.00) were doing yoga

2 times in a day. Among the male diabetic patients majority of them (84.0%) were yoga 1 time in a day and the minimum (16.00) were doing yoga 2 times in a day. Among the female diabetic patients majority of them (84.0%) were yoga 1 time in a day and the minimum (16.00) were doing yoga 2 times in a day.

**Table 6** Distribution of the Male and female respondents according to fasting blood sugar level after exercise

Blood sugar level (mg/dl)	Sex of the respondents				Total	
	Male		Female		No.	%
	No.	%	No.	%		
90-100	1	2.0	0	0.0	1	2.0
100-110	0	0.0	5	10.0	5	10.0
110-120	8	16.0	8	16.0	4	8.0
120-130	2	4.0	8	16.0	16	32.0
130-140	4	8.0	1	2.0	10	20.0
140-150	9	18.0	3	6.0	12	24.0
150 -160	1	2.0	0	0.0	1	2.0
Total	25	50.0	25	50.0	50	100.0
Mean	126.72		116.60		121.66	
SD	15.17		12.30		14.75	
t-test			2.591			
p			<0.05			

Table-4 reveals the distribution of the Male and female respondents according to blood sugar level after exercise. Out of the 50 male and female diabetic patients, majority of them (32.0 %) were having the blood sugar level 110-120,, followed by 24.00% having 140-150 and the minimum (2.00) have fasting blood sugar level after exercise(yoga ) of 90-100 and 150-160. Among the male diabetic patients, majority of them (36.000%) were having the blood sugar level after yoga of 140-150,, followed by 32.00% having 110-120 and the minimum (4.00)have fasting blood sugar level after exercise (yoga) of 90-100 and 150-160. Among the female diabetic patients, majority of them (32.000%) were having the blood sugar level after exercise(yoga) 110-120 and 120-130,, followed by 20.0% having 100-110 and the minimum (4.00)have fasting blood sugar level after yoga of 130-140. Further analysis of data from the table shows that the mean of fasting blood sugar level of the diabetic patients was 121.66 which were more among the male diabetic patients (126.72) as compared to female diabetic patients (116.60). Statistically significant difference regarding mean of fasting blood sugar level after exercise was observed between male and female diabetic patients ( $t=2.591, <0.05$ ) This difference might be occurred due to performing exercise, restricted diet and taking proper medicine<sup>7,8</sup>

## CONCLUSION

From the above observations, it can be concluded that exercise affects the blood sugar level in male as well as female respondents. From the study it is evident that yoga is beneficial in reducing blood glucose level in diabetics' patients Thus, along with other forms of treatment mild regular physical exercise played an important role in primary prevention of Type-2 diabetes. A significant decrease glucose levels were also observed, suggesting a positive effect of yoga asanas on glucose utilisation and fat redistribution in NIDDM. Yoga asanas may be used as an adjunct with diet and drugs in the management of Type 2 diabetes.

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### How to cite this article:

Archana Singh. 2018, Effect of Yoga on Blood Sugar Status in Diabetic Patients. *Int J Recent Sci Res*. 9(10), pp. 29431-29433. DOI: <http://dx.doi.org/10.24327/ijrsr.2018.0910.2860>

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