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A quasi-experimental study to assess the effectiveness of yoga asana on blood sugar level among type-II diabetes mellitus patients from selected area of Pune City

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***Abstract*---**Type-II diabetes mellitus has emerged as major health concern of Indians as well of world population. The patient with type-II diabetes mellitus can control the blood sugar level by incorporating various complimentary therapies. Aim of the study: To assess the effectiveness of yoga asana on blood sugar level among type-II diabetes mellitus patient from selected area of Pune city. Material and methods: The research approach adopted for this study was quantitative approach and the research design was quasi-experimental Non-Randomized Control Group Design. 88 patients with type-II diabetes mellitus were selective by purposive sampling. Out of those 88 patients, 44 were kept in experimental group and 44 were kept in control group. Demographic variable, clinical profile and assessment of fasting, postprandial blood sugar level was carried out among patient with Type-II diabetes mellitus on Day 1. Experimental group received intervention in terms of yoga asana and blood sugar level were assessed on Day 15 and Day 31. Result: Finding of the study stated that in experimental group, the Mean$\pm$SD of Fasting Blood Sugar Level (in mg/dL) on Day1 was 157.5$\pm$10.52, on Day 15 it was reduced to 154.84$\pm$6.97 and on Day 31 further reduced to 153.91$\pm$8.81. The Mean$\pm$SD of post prandial blood sugar level (in mg/dL) on Day 1 was 221.8$\pm$16.14, on Day 15 it was 218.2$\pm$13.08 and on Day 31 it was 217.14$\pm$11.42. Effectiveness of yoga asana on blood sugar level was analysed by Repeated Measures of ANOVA and pair wise comparison using paired t-test. In experimental group, p-value of repeated measures of ANOVA of fasting blood sugar level was 0.041

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(p<0.05) and that of postprandial blood sugar level was 0.031 (p<0.05). Both the results were significant at p<0.05 level. The p-value for paired t-test of Day 1 and Day 15 of fasting blood sugar level found to be 0.07 (p>0.05); however, that of Day 1 and Day 31 found to be 0.047 (p<0.05) which was less than 0.05 implying that the intervention was useful on reducing blood sugar level when continued for 31 days. Conclusion: The study concluded that yoga asana intervention was effective in terms of reducing fasting and postprandial blood sugar level in type-II diabetes mellitus patients.

***Keywords*---**type-II diabetes mellitus, yoga asana, fasting blood sugar, post prandial blood sugar.

Introduction

Nurses are an integral part of health care system and can help in management of diabetes in patients with addition of various complementary and alternative therapies based on theoretical and practical understanding. Diabetes Mellitus is an ailment discovered in Egyptian scripts dating back to 1500 B.C. The primeval Indian physician, Sushruta, and the surgeon Charaka were able to detect the two types, which were later to be identified as Type I and Type II diabetes. [1] The fundamental effect of diabetes is the decreased production or action of insulin. Insulin is a hormone that regulates glucose, fat and amino acids absorption. [2] In 2021, 463 million people have diabetes in the world and 88 million people in the Southeast Asia region. Of this 88 million people, 77 million belong to India. The number is projected to grow by 2045 to become 153 million. [3] Diabetes caused 1.5 million deaths in 2012 and an extra 2.2 million deaths by hypertension as comorbidity. 43% of these 3.7 million victims occur prior to the age of 70 years. [4] It is also responsible for the largest rise in male deaths among the top 10, with an 80% increase since 2000. [5] After onset of pandemic, diabetes is found to be one of the main risk factors for mortalities in patient with Coronavirus disease 2019(COVID-19) infection. Diabetic patients have a two- to four-fold increase in mortality and severity of COVID-19 than those without diabetes. [6] Yoga is a traditional mind-body system which originated in India around more than 4000 years ago. However, in recent decades only, there is an increase in yoga practice in both developed and developing countries worldwide and the field of yoga therapy is now growing rapidly. [7] Asanas are very good for invigorating the functions of pancreas. These Asana create pressure over pancreas and abdominal viscera and helps in controlling blood sugar. [8] Research conducted in 2007 in India shown that treatment cost increases with duration of diabetes, presence of complications, hospitalization, surgery, and insulin therapy.[9] Yoga practices helps in promotion and improvement of respiratory and cardiovascular function, helps in reducing stress, anxiety, depression, and chronic pain, improve sleep patterns, and enhance overall well-being and quality of life. [10] Yoga asana like “Leg-up-the-wall pose”, “Reclining-bound-angle pose”, “Half-lord-of-the-fishes pose”, “Child’s pose”, “Supine-spinal-twist pose” and “corpse pose” are effective for stimulating the function of abdominal organs, bladder and kidney. It also helps in reduction of stress and improves blood circulation. [11] During this pandemic situation where lockdown is frequent, yoga can also be used as a self-management by patients

with type-II DM. [12] Management of diabetes is important because it can keep a check on blood glucose, blood pressure and cholesterol. It can also help lower the chances of having myocardial Infraction, stroke and peripheral vascular disease. It helps to avoid other diabetes complication like diabetic neuropathy, kidney disease, foot problem, eye disease and bladder problem. Yoga asana is one of the managements methods, which is economical, can be performed at any place and need minimum supervision. Thus, this study would help the diabetes patients to know and perform different types of yoga asana that can help in reduction of Blood Sugar Level and improves the health condition.

The present study statement

"A quasi-experimental study to assess the effectiveness of yoga asana on blood sugar level among type-II diabetes mellitus patients from selected area of Pune city"

Material and Method

In present study, researcher adopted Quantitative approach & Quasi-experimental Non-Randomized Control Group design. It was carried out on 88 participants. The non-probability purposive sampling technique was used, data were collected by using structure questionnaire and in-vitro method. Tool validity was done by using by the experts from all the departments of Nursing, Yoga, Physical Education and Statistics. Reliability was done by using Cronbach alpha method. Pilot study was done on 10 participants, the study was found feasible.

Result

Result was divided into six sections.

S. No.	Section	Description
1.	Section I	Analysis of demographic variable and clinical characteristics
2.	Section II	Analysis of fasting and postprandial blood sugar level among patient with type-II diabetes mellitus before and after intervention of yoga in experimental group
3.	Section III	Analysis of fasting and postprandial blood sugar level among patient with type-II diabetes mellitus in control group before and after without intervention
4.	Section IV	Findings related to comparison of fasting, postprandial blood sugar level among patient with type II diabetes mellitus between experimental group with intervention and control group without intervention.
5.	Section V	Findings related to association between yoga asana and blood sugar level in experimental and control group
6.	Section VI	Findings related to comparison of glycosylated hemoglobin (HbA1C) blood sugar level in experimental and control group

Section I: Demographic and Clinical Data

Patients based on their demographic characteristics depicts majority of samples (43.18% in experimental and 33.82% in control group) were between 40-50 years

of age. Frequency distribution of gender shows majority of the samples in the study i.e., 65.91% in experimental group were male whereas 52.27% in control group are female. Distribution of education in control group shows that in experimental group majority of samples i.e., 40.9% were graduate whereas distribution of education in control group shows that in control group majority of samples i.e., 36.36% are higher secondary or diploma. Distribution of residential area depicts that maximum samples in both experimental and control group i.e.,72.73% in experimental group and 70.45% in control group were from Urban residential area. Distribution of occupation depicts that majority of samples in the study (38.64% in experimental and 34.09% in control) were self-employed and distribution of family history with dm shows majority of samples in experimental group i.e., 56.82% has other family members diagnosed with diabetes mellitus whereas in control group majority of samples i.e., 52.27% does not have any family member diagnosed with diabetes mellitus.

Section I(B) describes the Clinical Characteristics of patients.

Table 1 Frequency Distribution of Clinical profile 1

		Experimental		Control	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
DM Duration	Below 5 Years	10	22.73	7	15.91
	5-10 Years	22	50	9	20.45
	10-15 Years	12	27.27	17	38.64
	15-20 Years	0	0	11	25
	20-25 Years	0	0	0	0
	25-30 Years	0	0	0	0
	Above 30 years	0	0	0	0
Additional Complaints	Frequent Urination	9	20.45	3	6.82
	Increased thirst	5	11.36	4	9.09
	Fatigue	16	36.36	10	22.73
	Hunger	14	31.82	12	27.27
	Blurred Vision	0	0	15	34.09
	Any Other	0	0	0	0
Health Practice you are following	Allopathy	32	72.73	19	43.18
	Homeopathy	10	22.73	7	15.91
	Naturopathy	0	0	1	2.27
	Ayurvedic	2	4.55	2	4.55
	Unani	0	0	1	2.27
	Home Remedies	0	0	14	31.82

Table 01: depicted that regarding duration of suffering from type-II diabetes mellitus, majority of samples in experimental (27.27%) and control group (38.64%) were between 10-15 years of duration. Majority of samples from Experimental group has additional complaints as Fatigue i.e., 36.36% whereas control group samples have additional complaints as Blurred Vision i.e., 34.09%. The research data depicted that majority of samples (72.73% in exp group and

43.18 % in control group) were following Allopathy Health practices for their Diabetes management.

Table 2 Frequency Distribution of Clinical profile 2

		Experimental		Control	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
No of times eating meals in a day	Once a day	3	6.82	6	13.64
	Two times a day	6	13.64	9	20.45
	Three times a day	15	34.09	15	34.09
	Four times a day	13	29.55	8	18.18
	More than four times a day	7	15.91	6	13.64
Number of times you are skipping breakfast in a week?	Everyday	1	2.27	2	4.55
	Every Alternate Day	0	0	2	4.55
	Twice a Week	14	31.82	8	18.18
	Once a week	16	36.36	21	47.73
	Never	13	29.55	11	25
Since you are a diabetic, number of times you are following strict diabetic diet in a week	Everyday	1	2.27	6	13.64
	Every Alternate Day	4	9.09	6	13.64
	Twice a week	7	15.91	8	18.18
	Once a week	12	27.27	12	27.27
	Never	20	45.45	12	27.27

Table 02: shows data regarding eating habits, majority of samples in both experimental and control group i.e., 34.09 % and 34.09% respectively were eating meals 3 times a day. Majority of samples i.e., 36.69% of in experimental group and 47.73% in control group were skipping breakfast once in a week. 45.45% of samples in experimental group never followed strict diabetic diet whereas in control group 27.27% followed strict diabetic diet once a week and same percentage never follow.

Table 3 Frequency Distribution of Clinical profile 3

		Experimental		Control	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Do you exercise?	Yes	35	79.55	32	72.73
	No	9	20.45	12	27.27
Number of times you perform exercise in a week	Everyday	13	37.14	3	9.38
	Alternate Day	12	34.29	8	25
	Twice a Week	5	14.29	6	18.75
	Once a week	5	14.29	15	46.88

Type of exercise you are performing	Brisk Walking	15	42.86	14	43.75
	Running	9	25.71	8	25
	Aerobic Exercise	9	25.71	3	9.38
	Strength Exercise	2	5.71	7	21.88
Duration of exercise in a week	0-3 Hours	30	85.71	23	71.88
	3-6 Hours	5	14.29	5	15.63
	6-9 Hours	0	0	2	6.25
	Above 9 Hours	0	0	2	6.25

Table 03: depicts data regarding exercise, majority of samples i.e., 79.55% in experimental group and 72.73% in control group were doing exercise. Out of those who perform exercise, majority of sample i.e., 37.74% in experimental group perform exercise every day whereas 46.88% in control group perform once in a week. Regarding type of exercise, majority of samples in both experimental and control group i.e., 42.86 % and 43.75% respectively are doing brisk walking. Majority of samples in experimental group i.e., 85.71% and 71.88% in control group are performing exercise for 0-3 Hrs. duration in a week.

Table 4 Frequency Distribution of Clinical profile 4

		Experimental		Control	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Do you consume alcohol?	Yes	17	38.64	14	31.82
	No	27	61.36	30	68.18
Number of times in a week you are consuming alcohol	Everyday	0	0	2	14.29
	Every Alternate Day	2	11.76	3	21.43
	Twice a Week	5	29.41	5	35.71
	Once a week	10	58.82	4	28.57

Table 04: shows that majority of samples both in experimental group i.e., 61.36% and in control group i.e., 68.18% don't consume alcohol. Out of those who consume alcohol, majority of samples in experimental group i.e., 58.82% consume alcohol once in a week while 35.71% in control group consume twice a week.

Table 5 Frequency Distribution of Clinical profile 5

		Experimental		Control	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Do you smoke?	Yes	11	25	11	25
	No	33	75	33	75
Number of times you smoke in a week	Everyday	3	27.27	3	27.27
	Every Alternate Day	3	27.27	4	36.36
	Twice a Week	2	18.18	2	18.18

	Once a week	3	27.27	2	18.18
Number of cigarettes you smoke in a day	0-5 Cigarettes	5	45.45	4	36.36
	5-10 Cigarettes	3	27.27	4	36.36
	10-15 Cigarettes	2	18.18	2	18.18
	More than 15 Cigarettes	1	9.09	1	9.09

Table 05: shows that majority of samples i.e., 75% in both experimental and control group don't smoke. Out of the samples who smoke, majority of samples in control group i.e., 36.36% smoke every alternate day. Majority of samples in experimental group i.e., 45.45% smoke 0-5 cigarettes a day.

Table 6 : Frequency Distribution of Clinical profile 6

		Experimental		Control	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Do you suffer from hypertension	Yes	23	52.27	25	56.82
	No	21	47.73	19	43.18
Duration of suffering from hypertension	1-5 Years	7	30.43	3	12
	5-10 years	13	56.52	13	52
	10-15 years	3	13.04	6	24
	15 years and above	0	0	3	12
Any medication taking for Hypertension	Yes	14	60.87	14	56
	No	9	39.13	11	44

Table 06: depicts that majority of samples in experimental group i.e., 52.27% and 56.82% in control group are suffering from hypertension. Out of those who suffers from hypertension, majority of samples in experimental group i.e., 56.52% and 52% in control group are suffering for last 10-15 years. Majority of samples in both experimental i.e., 60.87% and control group i.e., 56% are taking medication for hypertension.

Table 7 Frequency Distribution of Clinical profile 7

		Experimental		Control	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Do you have any co-morbidities	Yes	11	25	18	40.91
	No	33	75	26	59.09
Co-morbidities present	Kidney Disease	7	63.64	9	50
	Glaucoma	1	9.09	4	22.22
	Dyslipidemia	0	0	1	5.56
	Hypothyroidism	3	27.27	4	22.22
BMI	Less than 18.5	0	0	0	0
	18.5 to 24.9	7	15.91	8	18.18
	25.0 to 29.9	37	84.09	35	79.55

	30.0 and above	0	0	1	2.27

Table 07: shows majority of samples i.e., 75% in experimental group and 59.09% in control group are not suffering from co-morbidities. Out of those suffering from co-morbidities majority of samples in both experimental and control group are suffering from kidney disease i.e., 63.64% and 50% respectively. Research date depicts that majority of sample in both experimental i.e., 84.09% and in control group i.e., 79.55% have BMI in range of 25.0 to 29.9. SECTION-II: Analysis of fasting and postprandial blood sugar level among patient with type-II diabetes mellitus before and after intervention of yoga in experimental group.

Table 8 Mean and Standard Deviation of Blood Sugar Level in Experimental Group

Day	Fasting Blood Sugar Level		Postprandial Blood Sugar Level	
	Mean	SD	Mean	SD
Day 1 (Pre-Intervention)	157.5	10.52	221.8	16.14
Day 15 (Post Intervention -1)	154.84	6.97	218.2	13.08
Day 31 (Post Intervention -2)	153.93	8.81	217.14	11.42

Table 08: shows that in experimental group the Mean±SD of Fasting Blood Sugar Level on Day 1 i.e., before intervention was 157.5±10.52, on Day 15 it was reduced to154.84±6.97 and on Day 31 it was further reduced to 153.91±8.81. The Mean±SD of post prandial blood sugar level on Day 1 was 221.8±16.14, on Day 15 it was 218.2±13.08 and on Day 31 it was 217.14±11.42

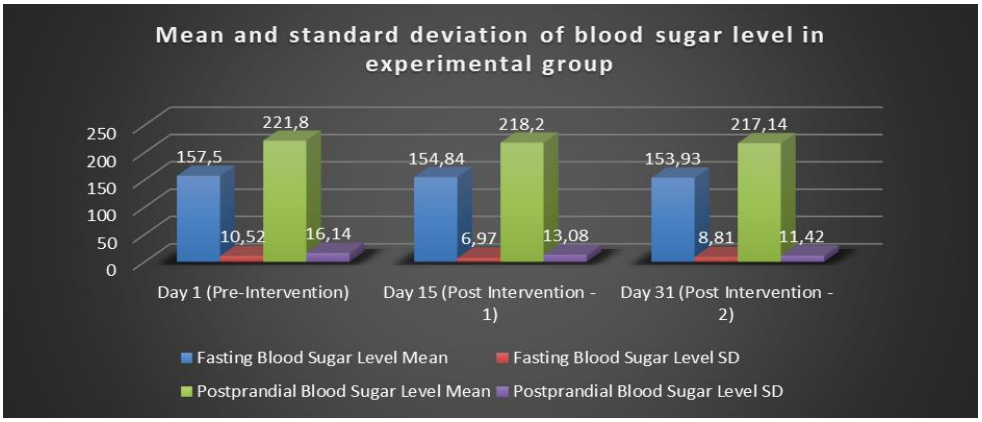

Figure 1 mean and standard deviation of blood sugar level in experimental group

SECTION-III: Analysis of fasting and postprandial blood sugar level among patient with type-II diabetes mellitus in control group before and after without intervention.

Table 9 Mean and Standard Deviation of Blood Sugar Level in Control Group

Day	Fasting Blood Sugar Level		Postprandial Blood Sugar Level	
	Mean	SD	Mean	SD
Day 1 (Pre-Intervention)	162.25	12.86	237.09	21.67
Day 15 (Post Intervention -1)	162.64	13.35	236.82	22.14
Day 31 (Post Intervention -2)	162.77	13.91	237.73	22.02

Where, Fasting and postprandial blood sugar level are in mg/dl

Table 09: shows that in control group the Mean±SD of Fasting Blood Sugar Level on Day 1 was 162.25±12.86, on Day 15 it was 162.64±13.35 and on Day 31 it was 162.77±13.91. The data shows that the fasting blood sugar level in control group without intervention has no major changes in fasting blood sugar level. The Mean±SD of post prandial blood sugar level on Day 1 was 237.09±21.67, on Day 15 it was 236.82±22.14 and on Day 31 it was 237.73±22.02. The data shows no major changes in postprandial blood sugar level in control group without intervention.

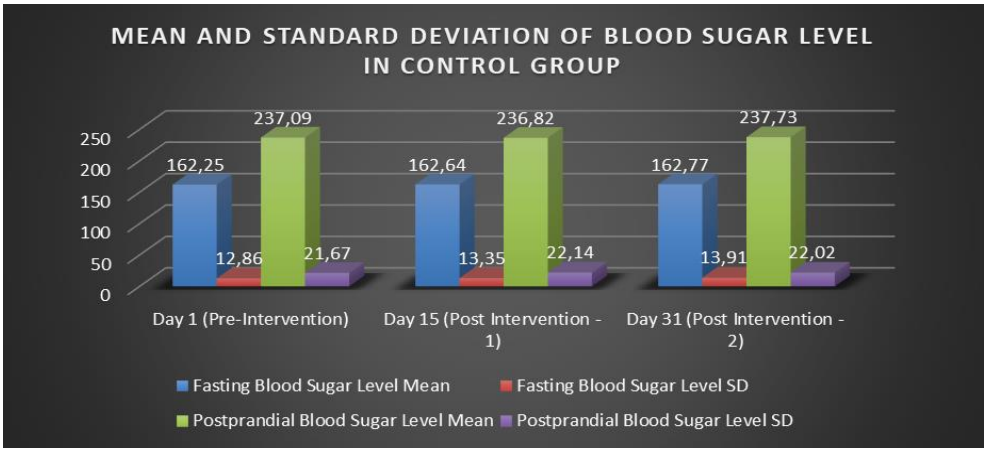

Figure 2 : mean and standard deviation of blood sugar level in control group

SECTION IV: This section compares the average change in blood sugar level in experimental and control group.

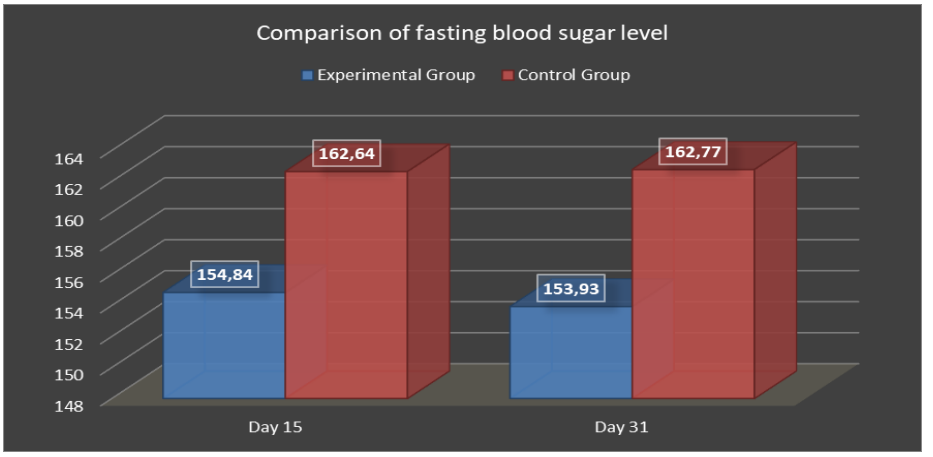

Figure 3 Comparison of fasting blood sugar level

Figure 10: shows the average change in fasting blood sugar level in experimental and control group. Mean fasting blood sugar level in experimental group was 154.84 and 153.93 on day 15 and day 31 respectively. Mean fasting blood sugar level in control group was 162.64 and 162.77 on day 15 and day 31 respectively. The intervention was found to be helpful in fasting blood sugar level as mean value of experimental group was less than in control group.

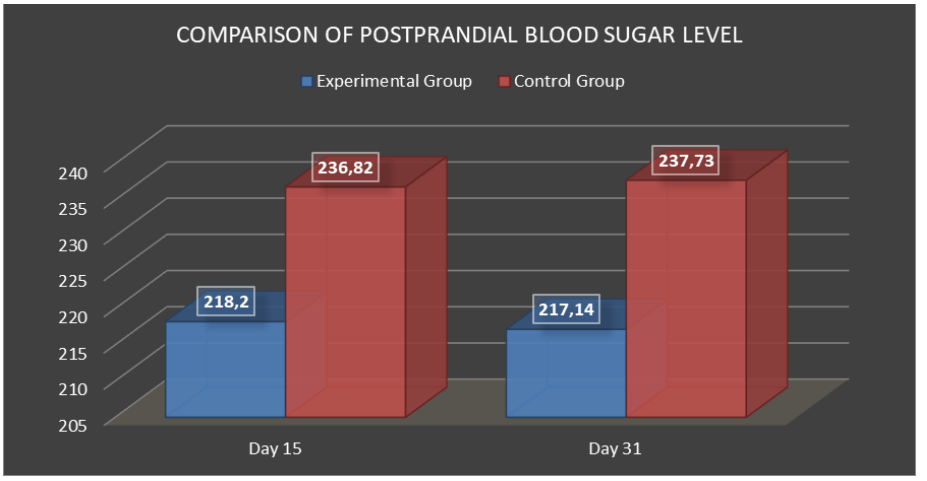

Figure 4 Comparison of postprandial Blood Sugar level

Figure 11: shows the average change in postprandial blood sugar level in experimental and control group. Mean postprandial blood sugar level in experimental group was 218.2 and 217.14 on day 15 and day 31 respectively. Mean postprandial blood sugar level in control group was 236.82 and 237.73 on day 15 and day 31 respectively. The intervention was found to be helpful in postprandial blood sugar level as mean value of experimental group was less than in control group.

SECTION V: This section describes the association of yoga asana intervention with blood sugar level in both experimental and control group.

Table 10 Repeated Measure of ANOVA (Experiment Group)

Parameter	Mean±SD			Df	p-value
	Day 1	Day 15	Day 31		
Fasting Blood Sugar	157.5±10.52	154.84±6.97	153.93±8.81	43	0.041
Postprandial Blood Sugar	221.8±16.14	218.2±13.08	217.14±11.42	43	0.031

Table 10: represents Repeated Measures of ANOVA for finding the effectiveness of yoga asana on fasting blood sugar level with type-II diabetes mellitus in the experimental group. P values of repeated measures of ANOVA considering all Day 1, Day 15 and Day 31 was 0.041 ($p<0.05$) for Fasting Blood Sugar and 0.031($p<0.05$) for post prandial blood sugar.

Table 11 : Pair wise Comparisons (Paired-t-test) Fasting Blood Sugar Experimental Group

Experimental Group						
(I) Time		Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Day 1	Day 15	2.66	1.12	0.07	-0.14	5.46
	Day 31	3.568*	1.42	0.047	0.03	7.10
Day15	Day1	-2.66	1.12	0.07	-5.46	0.14
	Day31	0.91	1.04	0.99	-1.68	3.49
Day31	Day1	-3.568*	1.42	0.047	-7.10	-0.03
	Day15	-0.91	1.04	0.99	-3.49	1.68

Table 11 represents pair-wise comparison of fasting blood sugar level to find the usefulness of intervention for each pair. The p-value for paired t-test of Day 1 and Day 15 found to be 0.07($p>0.05$) which was higher than 0.05 showing that the intervention has not shown its efficacy on Day 15. However, the p-value for paired t-test of Day 1 and Day 31 found to be 0.047($p<0.05$) which was less than 0.05 implying that the intervention was useful on fasting blood sugar level. This analysis found that yoga asana intervention slowly improves the blood sugar level in patients with type-II diabetes mellitus.

Table 12 Pair wise Comparisons (Paired-t-test) postprandial Blood Sugar Experimental Group

Experimental Group				
(I) Time	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval for Difference

					Lower Bound	Upper Bound
Day 1	Day 15	3.59	1.36	0.03	0.21	6.97
	Day 31	4.66	1.80	0.04	0.16	9.15
Day15	Day1	-3.59	1.36	0.03	-6.97	-0.21
	Day31	1.07	1.14	0.99	-1.78	3.92
Day31	Day1	-4.66	1.80	0.04	-9.15	-0.16
	Day15	-1.07	1.14	0.99	-3.92	1.78

Table-12 represents pair-wise comparison of postprandial blood sugar level to find the effectiveness of intervention for each pair. The p-value for paired t-test of Day 1 and Day 15 found to be 0.03($p<0.05$) and the p-value for paired t-test of Day 1 and Day 31 found to be 0.04($p<0.05$), both the p values are less than 0.05 implying that the intervention was useful on postprandial blood sugar level. This analysis found that yoga asana intervention improves the postprandial blood sugar level in patients with type-II diabetes mellitus.

Table 13 Repeated Measure of ANOVA (Control Group)

Parameter	Mean±SD			Df	p-value
	Day 1	Day 15	Day 31		
Fasting Blood Sugar	162.25±12.86	162.64±13.35	162.77±13.91	43	0.79
Postprandial Blood Sugar	237.09±21.67	236.82±22.14	237.73±22.02	43	0.42

Table 13 represents Repeated Measures of ANOVA applied on control group. On day 1 the fasting blood sugar level in control group has mean of 162.25±12.86. Mean±SD were 162.64±13.35 and 162.77±13.91 on day 15 and day 31 respectively. P values of repeated measures of ANOVA considering all Day 1, Day 15 and Day 31 was 0.79 ($p>0.05$) On day 1 the post prandial blood sugar level in experimental group has mean of 237.09±21.67. Mean±SD were 236.82±22.14 and 237.73±22.02 on day 15 and day 31 respectively. P values of repeated measures of ANOVA considering all Day 1, Day 15 and Day 31 was 0.42($p>0.05$) Since the P values are greater than 0.05 it shows there was no significant association.

Table 14 Table 14: Pair wise Comparisons (Paired-t-test) Fasting Blood Sugar Control Group

Control Group						
(I) Time		Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Day 1	Day 15	-0.39	0.69	0.99	-2.09	1.32

	Day 31	-0.52	1.02	0.99	-3.08	2.03
Day15	Day1	0.39	0.69	0.99	-1.32	2.09
	Day31	-0.14	1.11	0.99	-2.90	2.63
Day31	Day1	0.52	1.02	0.99	-2.03	3.08
	Day15	0.14	1.11	0.99	-2.63	2.90

Table-14 represents pair-wise comparison of fasting blood sugar level in control group for each pair. The p-value for paired t-test in control group was 0.99(p>0.05) which was higher than 0.05 showing that the there was no association.

Table 15 Pair wise Comparisons (Paired-t-test) Postprandial Fasting Blood Sugar Control Group

Control Group						
(I) Time		Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Day 1	Day 15	0.27	0.57	0.99	-1.15	1.70
	Day 31	-0.64	0.95	0.99	-3.01	1.74
Day15	Day1	-0.27	0.57	0.99	-1.70	1.15
	Day31	-0.91	0.73	0.66	-2.73	0.92
Day31	Day1	0.64	0.95	0.99	-1.74	3.01
	Day15	0.91	0.73	0.66	-0.92	2.73

Table-15 represents pair-wise comparison of postprandial blood sugar level in control group for each pair. The p-value for paired t-test in control group was 0.99(p>0.05) which was higher than 0.05 showing that the there was no association. This section compares the glycosylated hemoglobin (HbA_1c) blood sugar level in experimental and control group.

Table 16 Comparison HbA1c blood sugar level in experimental and control group using Independent-t-test

	Group	Df	Mean	SD	t-value	p-value
Hb1AC	Experimental	43	8.07	0.42	6.21	<0.001
	Control	43	8.67	0.49		

Table 16 represents comparison of glycosylated hemoglobin blood sugar level in experimental and control group. The Mean HbA1c blood sugar level in experimental group was found to be 8.07+ 0.42 whereas that in control group was found to be 8.67+0.49 at p value less than 0.001. The p value was less than 0.05 implying that the intervention was effective in experimental group in comparison in control group. The null hypothesis H02 was rejected, and research hypotheses was accepted.

Discussion

The data reveals the major findings about demographic variables of 88 sample, 44 sample from experimental group and 44 from control group. The study shows that majority of samples are from age group 40-50 years and it is prevalent among both male and female. It also shows that that diabetes mellitus is more common in urban residential area. The study shows that diabetes mellitus is prevalent irrespective of family history with diabetes mellitus. Majority of samples follow allopathy as health practice. The study shows that skipping breakfast and sedentary life with minimal exercise is another reason for prevalence of diabetes mellitus. Comorbidities majorly hypertension is associated with diabetes mellitus. It is more prevalent with sample with BMI between 25.0 to 29.9 The findings show that both fasting and postprandial blood sugar level reduces after yoga asana intervention in experimental group with statistical association whereas there were no major changes in control group without any intervention. The findings is in accordance with objective and hypothesis which state the present study was undertaken to assess the usefulness of yoga asana on blood sugar level among type-II diabetes mellitus patient from selected area of Pune city. The incidence of T2DM is increasing with increase in age, physical inactivity and sedentary lifestyle. [2] Type-II diabetes mellitus increases the risk of cardiovascular disease and stroke. Majority of samples follows allopathy and to control blood sugar level various drugs are recommended but they have its own drawbacks like drug dependency, drug resistance and adverse effect when used for a long time. As a result of that in recent years search for non-medical measures to control and prevent diabetes has increased.

The parameters included in the investigation are Fasting Blood Sugar, Post Prandial Blood Sugar and Glycosylated Hemoglobin (HbA1C). From the statistical analysis of the result obtained in the present study and its comparison with other published reports, it may be concluded that yoga asana helps in reducing blood sugar level in type-II diabetes mellitus patient. Yoga can be considered as inexpensive and non-invasive adjuvant therapy. Current study is supported by a prospective case control study conducted to find the efficacy of yoga on blood glucose with type-2 DM samples in Karnataka in 2015. The result of the study showed that yoga asana was active on managing blood sugar level of type-II diabetes mellitus patient. [13]

Conclusion

Based on the findings of present study the following conclusions were drawn, Quantitative data collected in Bharati Hospital and Research Centre, Rao Nursing Home and Diabetes Nectar Clinic of Pune city by Non-Probability Purposive Sampling Technique and according to sample selection criteria. Samples were patients with type-II diabetes mellitus. The sample size for this study was 88 as per calculation. To obtain required data for the study, the tool was developed and used for data collection for assessment of blood sugar level. The purpose of data collection was to analyze the collected data and find out the blood sugar level in patients with type-II diabetes mellitus. The demographic and clinical characteristics were analyzed by using frequency and percentage. ANOVA test and paired t-test was used to find out association between,

- Effectiveness of yoga asana on fasting blood sugar level
- Effectiveness of yoga asana on postprandial blood sugar level

This study shows that there is an association of yoga asana in improving the blood sugar level in patient with diabetes mellitus. Fasting blood sugar level on Day15 with baseline data shows there was no association in experimental group however day 31 shows the association which indicates that yoga needs a longer period to show the association. The results of this study demonstrated that the yoga asana is effective in reducing the blood glucose levels in patients with Type-II Diabetes Mellitus.

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