

EFFECT OF YOGA ON THYROID FUNCTION TESTS AND BIOCHEMICAL PARAMETERS IN PATIENTS SUFFERING FROM HYPOTHYROIDISM

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ABSTRACT

Aim: The aim was to study the effect of yoga on thyroid function tests and routine biochemical parameters in hypothyroid patients.

Materials and Methods: Out of 100 patients of hypothyroidism, 83 completed the trial (41 in control and 42 in yoga group). The yoga group received intervention along with Thyroxine replacement and control group was given only Thyroxine replacement therapy. 45 minutes yoga session was given thrice a week for first 2 months and twice in a week for next 4 months. Levels of Thyroid function test, Anti-thyroid peroxidase (Anti-TPO), routine biochemical parameters including blood glucose, HbA1c, Liver function tests, Muscle related enzymes, Kidney function tests and Lipid profile were estimated.

Results: There was significant increase in fT4 levels ($p=0.001$ for control and $p=0.004$ for yoga group), significant decrease in TSH levels ($p=0.000$ for both the groups) and significant decrease in Anti-TPO antibody levels ($p=0.002$ and $p=0.02$ for control and Yoga group respectively). In Control group decreased TSH levels did not meet the clinical euthyroid range whereas in the Yoga group normal TSH range was achieved. In Yoga group a significant decrease in fasting blood sugar ($p=0.04$) and cholesterol level ($p=0.000$) was observed. The amount of Thyroxine medicine taken by Control group increased significantly ($p=0.000$).

Conclusion: Yoga helps in the better management of Thyroid function tests, and some biochemical parameters without any increase of Thyroxine medication.

Clinical Significance: : Yoga as an adjunct therapy can be effective in controlling hypothyroidism.

Keywords: Anti-TPO; fT3; fT4; TSH; Yoga

INTRODUCTION: Hypothyroidism is a clinical state resulting from under production of the thyroid hormones T4 and T3¹. In India, thyroid disorders are most common among all endocrine disorders, with state of hypothyroidism being more common than states of hyperthyroidism and thyroid carcinoma². Prevalence of hypothyroidism in India is around 11%³. In hypothyroidism patients, anti-TPO

antibody positivity is an established marker of autoimmune thyroid disease⁴.

Although treatment of hypothyroidism is considered simple but studies continue to show problems in the management of this condition. Many patients on thyroid hormone replacements are either under-treated or over-treated and a significant number of patients on thyroid hormone replacement report of not feeling well. This is in spite of having thyroid function

tests within the healthy reference range. So non-pharmacological lifestyle interventions like yoga may be recommended for management of hypothyroidism. Any mode of exercise or physical activity corresponds to a physical stress on the endocrine system that challenges homeostasis^{5,6}. The influence of exercise on thyroid function seems to depend on the intensity and the duration of the training protocol⁷.

Yoga, practiced in Indian culture since ages, has recently received great deal of attention. Yoga focuses on unifying the mind, body, and spirit encouraging a greater feeling of connection between the individual and its surroundings. Beyond this, there are several secondary goals, such as improving physical health and enhancing mental well-being and emotional balance. Our strategy for controlling hypothyroidism using Yoga modalities were focussed on revitalizing thyroid gland so that it can function properly. We wanted to learn if people with hypothyroidism may get help from yoga. Therefore, this study was planned to develop a unique user-friendly program of Yoga modalities, so as to combat the menace of the hypothyroidism. The study was carried out to see the effect of Yoga based interventions on routine biochemical parameters and thyroid function tests, since only few studies have reported such effects.

MATERIALS AND METHODS

The study was a prospective randomized control trial carried out at Babu Nature Cure Hospital and Yogashram, Mayur Vihar Phase 1, Delhi. Duration of the study was two years (March 2017-March 2019) and study was conducted after due approval from the Ethical Committee of Babu Nature Cure Hospital and Yogashram, Delhi. Biochemical investigations were carried out at GIPMER, New Delhi

Subjects and Study design

Hypothyroidism patients with TSH level >10 mIU/L and satisfying the American Association of Clinical Endocrinologists (AACE) criteria were recruited from various groups of society. In all 100 hypothyroidism patients in the age group 21-65 years were enrolled. Using random number table method, the patients were divided randomly into two Groups of 50 each i.e. Group I (control group) and Group II (Yoga group). 83 participants completed the trial (41 in control and 42 in yoga group). Patients were educated about the disease and associated risk factors and about the benefits of Yoga. Written consent was obtained from patients and they were provided with an information sheet and a daily diary to record the compliance to the trial protocol and medicines. Complete demographic details, clinical history, present and past medications were recorded for each patient at the time of registration.

Yoga training protocol- The Intervention group received interventions based on Yoga along with Thyroxine replacement, while the control group were prescribed only Thyroxine replacement therapy. Recording of parameters for both the groups was done at baseline, after 3 months and 6 months, post-intervention. Participants attended 45 minutes group yoga training sessions scheduled between 6AM to 9AM. The frequency of sessions was thrice a week for first 2 months and twice in a week for next 4 months. Details of Yoga practices followed have been mentioned in Table 1. On days without session, patients were advised to continue this practice for 20-25 minutes at home. The daily adherence to this program was evaluated by analyzing patient diary that was collected every month. In case of any inflammation in the joints the movement and postures were modified or omitted to avoid strain.

Table 1: Details of Yoga module for intervention group

S. No	Practice	Details	Duration
1	OM Chanting		3 times
2	Loosening exercises		12 minute
3	Suryanamaskara	12 steps minimum 1 to maximum 4 rounds	8 minutes
4	Asana practices	Simhasan, Saralamatsyasan, Vipareetakarani, Setubhandha, Sahavasana	15 minutes
5	Bandha	Jalandharabandha	
6	Pranayama & kriyas	Kapalabhati (30 to 60 strokes) Ujjayi (10 breaths) Naadishodhana (10 rounds) Surya anulomaviloma(20 breaths) Chandra anulomaviloma(20breaths)	10 minutes
7	OM chanting		3 times
Total Time			45 Minutes

Doses of Thyroxine were modified according to the activity of disease. The blood samples were taken prior to the intervention and after 3rd and 6th month for study of biochemical and hormonal parameters.

Estimations: In this study thyroid function tests (fT3, fT4, TSH) and Anti-thyroid peroxidase (Anti-TPO) antibody estimation were performed using Roche CLIA-cobas-e411 analyzer. Fasting blood sugar (FBS), Liver function tests [Bilirubin, Aspartate transaminase (AST), Alanine Transaminase (ALT), Alkaline phosphatase (ALP), Protein and Albumin] Muscle related enzymes [Lactate Dehydrogenase (LDH), Creatine Kinase-MB (CK-MB)], Kidney function tests

(Urea, Creatinine, Uric acid), Lipid profile [Cholesterol, Triglyceride (TG), HDL-c] estimations were done using fully auto analyzer Roche cobas-c-501. HbA1c was estimated using HPLC system for HbA1C testing (Biorad D-10).

OBSERVATIONS AND RESULTS:

Baseline characteristics of participants of Control (group I) and Yoga (group II) were recorded (Table 2). At the beginning of the study the subjects were found to be matched for biochemical parameters and there was no statistical significant difference in any of the parameters except total Bilirubin, the values for which for both the groups were however within normal range.

Table 2: Baseline characteristics of participants of Control(n=41) group I and Yoga(n=42) group II

Parameters	Control Gp Mean±SD	Yoga Gp Mean±SD	p-value
fT3 (pg/ml)	2.9±0.44	2.87±0.66	0.73
fT4 (ng/dl)	1.04±0.23	1.02±0.42	0.70
TSH (uIU/ml)	14.53±9.58	16.36±10.05	0.40
Anti-TPO(IU/ml)	225.12±231.9	173.07±191.0	0.27
FBS (mg/dl)	91.51±14.46	95.02±23.80	0.42
HbA1c (%)	5.29±0.59	5.37±1.23	0.73
Cholesterol (mg/dl)	177.68±34.56	182.21±34.18	0.55
Triglyceride (mg/dl)	130.44±72.14	133.26±63.06	0.82
HDL (mg/dl)	53.22±16.26	50.95±11.06	0.45
Urea (mg/dl)	21.90±5.25	21.78±7.67	0.93

Creatinine (mg/dl)	0.74±0.16	0.82±0.72	0.49
Uric acid (mg/dl)	4.39±1.33	4.54±1.66	0.61
Total bilirubin (mg/dl)	0.47±0.24	0.37±0.16	0.03*
Total protein (mg/dl)	7.54±0.63	7.56±0.45	0.88
Serum albumin (mg/dl)	4.45±0.36	4.40±0.28	0.47
ALP (U/L)	87.56±24.42	82.89±24.65	0.39
AST (U/L)	27.05±15.00	24.46±11.16	0.37
ALT (U/L)	23.39±11.66	22.16±9.74	0.60
LDH (U/L)	187.46±34.25	193.02±85.82	0.70
Ck- MB (U/L)	15.59±5.45	14.26±5.31	0.27

* p<0.05, ** p<0.01, *** p<0.001

Comparison of changes in Biochemical parameters within Control and Yoga group has been shown in Table 3. In control group there was no significant change in FBS, but intervention group patients showed a significant decline in fasting

blood sugar levels(p=0.04) after undergoing yoga. In Yoga group patients there was significant reduction in their mean serum cholesterol level (p= 0.000) but no significant change was observed between pre and post intervention serum cholesterol levels in Control group.

Table 3: Comparison of changes in Biochemical parameters in Control (n=41) group I and Yoga(n=42) group II

Parameters	Gp	Baseline	3 rd Month	6 th Month	RM ANOVA	
		Mean±SD	Mean±SD	Mean±SD	F-stat	P-Value
FBS (mg/dl)	I	91.51±14.46	91.15±13.23	89.76±12.22	0.40	0.63
	II	95.02±23.80	91.04±10.86	87.14±3.94	4.05	0.04*
HbA1c(%)	I	5.29±0.59	5.23±0.62	5.30±0.42	0.30	0.73
	II	5.37±1.23	5.36±0.79	5.19±0.48	0.963	0.36
CHOL (mg/dl)	I	177.68±34.56	166.83±28.94	171.19±35.61	2.11	0.12
	II	182.21±34.18	170.31±26.87	164.38±24.92	10.46	0.000***
TG (mg/dl)	I	130.44±72.14	132.32±66.06	126.34±50.40	0.188	0.81
	II	133.26±63.06	127.24±43.00	121.83±45.51	1.15	0.31
HDL (mg/dl)	I	53.22±16.26	48.83±12.82	52.93±29.00	0.59	0.49
	II	50.95±11.06	51.09±10.93	51.52±11.71	0.08	0.90
UREA (mg/dl)	I	21.90±5.25	21.93±6.65	21.16±8.06	0.29	0.70
	II	21.78±7.67	22.38±9.56	21.69±6.49	0.92	0.80
CRE (mg/dl)	I	0.74±0.16	0.74±0.14	1.38±2.39	2.94	0.09
	II	0.82±0.72	0.73±0.20	0.70±0.16	1.38	0.31
UA (mg/dl)	I	4.39±1.33	4.64±0.96	4.72±1.42	1.33	0.26
	II	4.64±1.66	4.88±1.25	4.91±1.18	2.97	0.07
T-BIL (mg/dl)	I	0.47±0.24	0.51±0.31	0.48±0.23	0.59	0.55
	II	0.37±0.16	0.36±0.11	0.39±0.15	1.07	0.34
TP (mg/dl)	I	7.54±0.63	7.69±0.47	7.67±0.56	1.15	0.31
	II	7.56±0.45	7.62±0.44	7.49±0.33	0.95	0.38
ALB (mg/dl)	I	4.45±0.36	4.43±0.33	4.61±1.04	1.05	0.32
	II	4.40±0.28	4.31±0.70	4.48±0.30	1.62	0.21
ALP (U/L)	I	87.56±24.42	85.85±23.91	87.56±22.49	0.17	0.81
	II	82.89±24.65	80.52±26.03	83.09±21.97	0.332	0.69
AST (U/L)	I	27.05±15.00	23.19±8.32	24.59±9.64	1.59	0.21
	II	24.46±11.16	22.12±8.33	21.98±13.02	1.32	0.27
ALT	I	23.39±11.66	22.28±10.13	20.83±6.29	1.35	0.26

(U/L)	II	22.16±9.74	22.42±9.74	24.98±17.60	1.40	0.25
LDH	I	187.46±34.25	187.07±46.43	183.35±36.57	0.21	0.80
(U/L)	II	193.02±85.82	186.78±50.37	176.98±44.07	0.84	0.39
CK-MB	I	15.59±5.45	14.71±6.59	15.66±6.90	0.35	0.69
(U/L)	II	14.26±5.31	13.83±6.43	14.40±5.89	0.239	0.57

* p<0.05, ** p<0.01, *** p<0.001

In the Yoga group II, pair wise mean effect between the test intervals using Bonferroni comparison (Table 4), showed that level of significance for the decrease in FBS

from 0 to 6th month was p=0.020. For decrease in Cholesterol, the level of significance was p=0.009 for baseline to 3rd month and p=0.001 for baseline to 6th month.

Table 4: Pair wise mean effect between the test intervals using Bonferroni comparison for significant Biochemical parameters in Yoga Group II

	Time Interval		Mean Difference	SE	P-Value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
FBS	Baseline ----- 3 rd Month	3 rd Month	3.376	2.87	0.737	-3.78	10.53
		6 th Month	7.876	3.53	0.904	-0.93	16.68
	3 rd Month ----- 6 th Month	6 th Month	3.530	1.57	0.020*	0.56	8.43
Cholesterol	Baseline ----- 3 rd Month	3 rd Month	11.905	3.76	0.009**	2.50	21.30
		6 th Month	17.833	4.65	0.001***	6.20	29.45
	3 rd Month ----- 6 th Month	6 th Month	5.929	3.38	0.262	-2.52	14.38

* p≤0.05, ** p≤0.01, *** p≤0.001

Comparison of changes in Thyroid function test within Control and Yoga group (Table 5) shows that baseline serum TSH concentrations of both groups were in the overt hypothyroidism range. After intervention, there was significant reduction in TSH concentration (p= 0.000

for both groups) after 3 and 6 months. However in the yoga group, mean TSH level decreased to normal physiological range. For fT4, both the groups showed significant increase in its levels (p=0.001 and p=0.004 for control and Yoga group respectively).

Table 5 : Comparison of changes in Thyroid function test in Control (n=41) group I and Yoga(n=42) group II

Parameters	Groups	Baseline	3 rd Month	6 th Month	RM ANOVA	
		Mean ± SD	Mean ±SD	Mean±SD	F-stat	P-Value
fT3 (pg/ml)	I	2.90±0.44	3.01±0.79	2.97±0.42	0.42	0.61
	II	2.87±0.66	3.01±0.43	3.09±0.53	2.60	0.09
fT4 (ng/dl)	I	1.04±0.23	1.18±0.24	1.19±0.25	7.48	0.001**
	II	1.02±0.42	1.20±0.26	1.21±0.23	6.68	0.004***
TSH (uIU/ml)	I	14.53±9.58	7.33±8.35	7.74±8.08	26.38	0.000***
	II	16.36±10.05	5.81±4.83	3.97±3.18	53.71	0.000***

* p<0.05, ** p<0.01, *** p<0.001

In the Control group, pair wise mean effect between the test intervals, using Bonferroni comparison (Table 6) showed that level of significance for the increase in

fT4 from 0 to 3rd month was p=0.016 and from 0 to 6th month was p=0.003. For TSH the level of significance, for the decrease observed, was p=0.000 for baseline to 3rd and p=0.000 for baseline to 6th month.

Table 6: Pair wise mean effect between the test intervals for significant Thyroid function tests using Bonferroni comparison in Group I

	Time Interval		Mean Difference	SE	P-Value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
fT4	Baseline ----- 3 rd Month	3 rd Month	-0.140	0.047	0.016*	-0.258	-0.021
		6 th Month	-0.154	0.043	0.003***	-0.261	-0.47
	3 rd Month	6 th Month	-0.014	0.041	1.00	-0.118	0.089
TSH	Baseline ----- 3 rd Month	3 rd Month	7.204	1.150	0.00**	4.332	10.077
		6 th Month	6.802	1.223	0.00***	3.746	9.859
	3 rd Month	6 th Month	-0.402	0.954	1.00	-2.785	1.981

* p≤0.05, ** p≤0.01, *** p≤0.001

In the Yoga group, pair wise mean effect between the test intervals, using Bonferroni comparison, (Table 7) showed that level of significance for the increase in fT4 from 0 to 3rd month was p=0.023 from

0 to 6th month was p=0.015. For TSH the level of significance, for the decrease observed, was p=0.000 for 0 to 3rd and for 0 to 6th month and p= 0.05 for 3rd to 6th month.

Table 7: Pair wise mean effect between test intervals for significant Thyroid function tests using Bonferroni comparison in Yoga Group II

	Time Interval		Mean Difference	SE	P-Value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
fT4	Baseline	3 rd Month	-0.189	0.68	0.023*	-0.358	-0.021
		6 th Month	-0.191	0.64	0.015*	-0.352	-0.030
	3 rd Month	6 th Month	-0.002	0.46	1.00	-0.117	0.114
TSH	Baseline	3 rd Month	10.553	1.526	0.000***	6.743	14.363
		6 th Month	12.391	1.458	0.000***	8.752	16.030
	3 rd Month	6 th Month	1.838	0.736	0.050*	0.002	3.674

* p≤0.05, ** p≤0.01, *** p≤0.001

Anti-TPO antibody estimation was done at baseline and after 6 months of intervention (Table 8). It was observed that patients reporting higher anti TPO antibody were 28 in control group and 27 in Yoga group. Paired t-test comparison between the mean anti-TPO antibodies concentrations at

baseline and after 6 months of intervention showed significant reduction in both the groups (P=0.002 and P=0.02 for control and Yoga group respectively) at baseline and after 6 months of treatment. However, the mean Anti-TPO antibody concentration did not reach the normal range (< 34) in either of the two groups.

Table 8: Comparison of Anti-TPO antibody in Control(n=28) Group I and Yoga (n=27) Group II at baseline and after 6 months of treatment (Hashimoto's thyroiditis)

Groups	Baseline	6 Month	t value	P value
	Mean ± SD	Mean ± SD		
Control Group n=28	320.20 ± 223.8	239.6 ± 231.2	3.05	0.002**
Yoga Group n=27	257.22 ± 191.9	209.11 ± 213	2.32	0.02*

* p<0.05, ** p<0.01, *** p<0.001

Mean Thyroxine medication dose increased significantly among control group. In yoga group, there was no

significant increase in mean Thyroxine dose either after three months or six months of treatment (Table 9).

Table 9: Change in Thyroxine medication dose (mcg) in the Control(n=41) Group I and Yoga (n=42) Group II

Group	Baseline	3 rd month	6 th month	RM ANOVA	
	Mean±SD	Mean±SD	Mean±SD	F- value	P value
Gp I	57.81±33.45	69.37±41.59	76.26±45.19	18.83	0.00***
Gp II	73.31±44.99	72.64±41.55	70.29±40.45	0.639	0.53

* p<0.05, ** p<0.01, *** p<0.001

Statistical Analysis

The data was analyzed by an independent statistician, not related to the study. Blinding of data was followed during analysis. The data was analyzed using SPSS16 version software. The statistical significance is considered at p<0.05 levels for all the parameters and the values are expressed as mean ± SD.

DISCUSSION

Studies show that thyroid hormones play a role in development and function of cardiovascular, nervous, immune and reproductive system⁸. Also adequate thyroid function is essential for normal development and retention of cognitive function throughout life⁹. Thyroid hormones are important regulators of energy metabolism and may influence energy processes during physical exercise¹⁰.

Yoga as an alternative system of healing is widely practiced to prevent and treat thyroid gland dysfunction. Many of the thyroid disorders occur due to excessive stress. Yoga is useful in maintaining the right balance between the mind and body and can help to reduce stress and anxiety to a great extent¹¹. In recent times there is a shift in treatment hypothesis of various diseases. So, Complementary and Alternative Medical (CAM) therapies such as yoga are being increasingly used as adjuncts to modern medicine.

Aim of the present study was to look at the effects of 3 and 6 months of yoga

training on the thyroid function and biochemical parameters. It was observed that after 6 months of yoga treatment in both control and Yoga groups there was significant increase in fT4 level and a significant decrease in TSH and Anti-TPO antibody levels in both the groups. However in the yoga group, mean TSH level decreased to clinical euthyroid range. Fasting blood sugar and cholesterol levels was found to decrease significantly in yoga group only. Mechanism of yoga in controlling hypothyroidism is that Yogic *asanas, pranayama,* and meditation rejuvenate thyroid glands. *Yogasanas* like *Suryanamaskar,* are very effective in controlling hypothyroidism and *Pranayamas* like *Kapal Bhati, anulom-vilom, Ujjayi* are beneficial not only for hypothyroidism but also for the health of the endocrine system. The results of present study is in line with the results recorded by Chatterjee and Mondal⁷ that transcendental meditation gives rise to a unique state of deep rest by marked reductions in resting heart rate, respiratory rate, oxygen consumption, metabolic activity and increased cerebral blood flow which may be responsible for the decrease of serum TSH in the human body. Regular practice of *pranayama* and meditation may send a positive stimulus to the hypothalamus and pituitary. Moreover specific yogic poses can stimulate throat area by squeezing and stretching or

massaging the thyroid gland placed in the neck region. Research results by Bansal et.al.¹² showed that medium-intensity aerobic exercise, produced the best results for improving TSH and improved thyroid function may be through better perfusion of gland. Also in the treatment of hypothyroidism proper absorption of orally administered Thyroxine in the intestine is a critical step. In a study it was observed that Yoga improved eating disorders in adolescents¹³. It is also possible that Yoga improved absorption of ingested Thyroxine in the intestine and resulted in better control of serum TSH levels in the intervention groups.

As per the AACE recommendations, the effective treatment of Hypothyroidism is restoring the elevated serum TSH to the normal physiological range¹⁴. In the Control group mean TSH levels did not meet the clinical euthyroid range. Mean serum TSH patients in the Yoga group reached the normal TSH range only 6 months of intervention. This clearly shows that Yoga intervention along with Thyroxine replacement was more effective in controlling hypothyroidism when compared to Thyroxine replacement alone. In our study 26 patients in control group and 27 in Yoga group reported higher anti TPO antibody. The concentration of serum Anti-TPO antibodies is reduced significantly across both the groups, although it did not reach the normal level in any of the groups. Higher concentration of Anti-TPO antibodies indicates presence of autoimmune thyroid disease. For the increase in anti-TPO positivity the underlying pathogenesis may involve a complex interplay of genetic, environmental and other endogenous factors^{15, 16, 17}.

Hyperlipidaemia particularly hypercholesterolemia, is a well documented, significant health consequence associated with hypothyroidism and obesity. Dyslipidemia associated with hypothyroidism is characterized by a

decrease in HDL-Cholesterol and an increase in both total cholesterol and low Density Lipoprotein – Cholesterol (LDL-C). In Yoga group a significant decrease in cholesterol level was found in our study. Reduction in serum cholesterol is similar to those reported by Telles et al.¹⁸. A similar study conducted by Nilakanthan et al.¹⁹ on hypothyroid women also reported significant reduction in serum cholesterol concentration following six months Yoga intervention.

The results from our study showed that post intervention there was significant reduction in FBG by yoga. However levels of HbA1c in our study were found to be in the normal range and there was no significant change in its levels in any of the groups. The reduction in FBS observed in our study is similar to several studies conducted earlier. A study conducted by Chimkode et al.²⁰ also reported lowering of FBS after a six month of Yoga intervention.

It has been found during the period of study that the amount of Thyroxine medicine taken by control group increased significantly whereas there was no change in the yoga group. A long-term intake of artificial hormones eventually results in reduced functioning of the gland and also the reliance on artificial hormones may increase over a period of time. Yoga not only serves as a helpful therapy in relieving existing symptoms, but also prevents further damage to the thyroid gland. A unique user-friendly healthy lifestyle can be achieved by following regular yoga schedule. This study may be helpful to motivate patients to take up responsibilities of their own health mainly by following regular Yoga practice.

CONCLUSION

As observed in our study, in Control group the decreased TSH levels did not meet the clinical euthyroid range whereas in the Yoga group the normal TSH range was achieved. Also the dose of Thyroxine medicine increased significantly in control group but not in the Yoga group. Hence

six months of Yoga as an adjunct intervention therapy was comparatively more effective in controlling hypothyroidism and resulted in reducing dependence on synthetic hormones. Considering the results obtained from our study, Yoga may be prescribed as a safe and beneficial adjunct intervention to prevent progression of the disease to severity.

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Image .1 Before start of the yoga intervention Image.2 After 3 months of yoga

RESULT BEFORE START OF YOGA INTERVENTION

DEPARTMENT OF BIOCHEMISTRY
GB PANT INSTITUTE OF POST GRADUATE MEDICAL EDUCATION & RESEARCH (GIPMER)
(GOVT. OF NCT OF DELHI)

TEST REPORTING FORM
Date: 25/12/17

Name: ANITA JAINANT KUMAR Age/Sex: 32/F Ward/OPD: Group Yoga
S. GROUP No: 3 Diagnosis: HYPOTHYROIDISM Time of Collection:

GLUCOSE PROFILE	FASTING (70-99 mg/dl) HPGCO-POD: 111	PP (2HR) (140 mg/dl) HPGCO-POD:	RBS (140 mg/dl) HPGCO-POD:	HBA1c (5.7%) HPLC:
LIPID PROFILE	CHOLESTEROL (x 200 mg/dl) CHOD-POD: 174	TG (x 150 mg/dl) GPO: 143	HDL (40-60 mg/dl) PEG-CE: 46	LDL (x 100 mg/dl) PEG-CE: 99
RENAL PROFILE	UREA (x 50 mg/dl) UREASE-GLDH: 26	CREATININE (F) (0.5-0.9 mg/dl) JAFFE KINETIC (M) (0.7-1.2 mg/dl): 0.6	URIC ACID (F) (2.4-5.7 mg/dl) URICASE (M) (3.4-7 mg/dl): 3.8	
HEPATIC PROFILE	T.BIL (0.3-1.2 mg/dl) DPO: 0.3	T.PROTEIN (6-8 gm/dl) BIURET: 7.8	ALBUMIN (3.5-5 gm/dl) BCL: 4.5	ALP (30-115 U/L) AMP-PNP: 67
CARDIAC PROFILE	SGOT (10-40 U/L) UV KINETIC: 3.8	SGPT (10-40 U/L) UV KINETIC: 1.7	LDH (110-240 U/L) UV KINETIC: 52.6	CK-T (M) (48-171 U/L) NAC ACTIVATED: 17
ELECTROLYTES	Na ⁺ (135-145 mEq/L) ISE: A70-63	K ⁺ (3.5-5.3 mEq/L) ISE: T ₃ -2.8	Ca ²⁺ (8.8-10.4 mg/dl) ISE: T ₄ -0.9	PHOSPHORUS (2.5-4.5 mg/dl) ISE: TSH-16.6 (30% of NCT of Delhi)

RESULT AFTER 3 MONTHS OF YOGA

DEPARTMENT OF BIOCHEMISTRY
GB PANT INSTITUTE OF POST GRADUATE MEDICAL EDUCATION & RESEARCH (GIPMER)
(GOVT. OF NCT OF DELHI)

TEST REPORTING FORM
Date: 28/4/18

Name: ANITA JAINANT KUMAR Age/Sex: 32/F Ward/OPD: Group Yoga
S. GROUP No: 3 Diagnosis: HYPOTHYROIDISM Time of Collection:

GLUCOSE PROFILE	FASTING (70-99 mg/dl) HPGCO-POD: 78	PP (2HR) (140 mg/dl) HPGCO-POD:	RBS (140 mg/dl) HPGCO-POD:	HBA1c (5.7%) HPLC:
LIPID PROFILE	CHOLESTEROL (x 200 mg/dl) CHOD-POD: 172	TG (x 150 mg/dl) GPO: 154	HDL (40-60 mg/dl) PEG-CE: 35	LDL (x 100 mg/dl) PEG-CE: 103
RENAL PROFILE	UREA (x 50 mg/dl) UREASE-GLDH: 33	CREATININE (F) (0.5-0.9 mg/dl) JAFFE KINETIC (M) (0.7-1.2 mg/dl): 0.5	URIC ACID (F) (2.4-5.7 mg/dl) URICASE (M) (3.4-7 mg/dl): 5.2	
HEPATIC PROFILE	T.BIL (0.3-1.2 mg/dl) DPO: 0.3	T.PROTEIN (6-8 gm/dl) BIURET: 7.6	ALBUMIN (3.5-5 gm/dl) BCL: 4.8	ALP (30-115 U/L) AMP-PNP: 64
CARDIAC PROFILE	SGOT (10-40 U/L) UV KINETIC: 13	SGPT (10-40 U/L) UV KINETIC: 16	LDH (110-240 U/L) UV KINETIC: 110	CK-T (M) (48-171 U/L) NAC ACTIVATED: 80
ELECTROLYTES	Na ⁺ (135-145 mEq/L) ISE: T ₃ -3.2	K ⁺ (3.5-5.3 mEq/L) ISE: T ₄ -1.1	Ca ²⁺ (8.8-10.4 mg/dl) ISE:	PHOSPHORUS (2.5-4.5 mg/dl) ISE: TSH-0.8 (Significantly reduced)

Image.3 After 6 months of yoga

RESULT AFTER 6 MONTHS OF YOGA

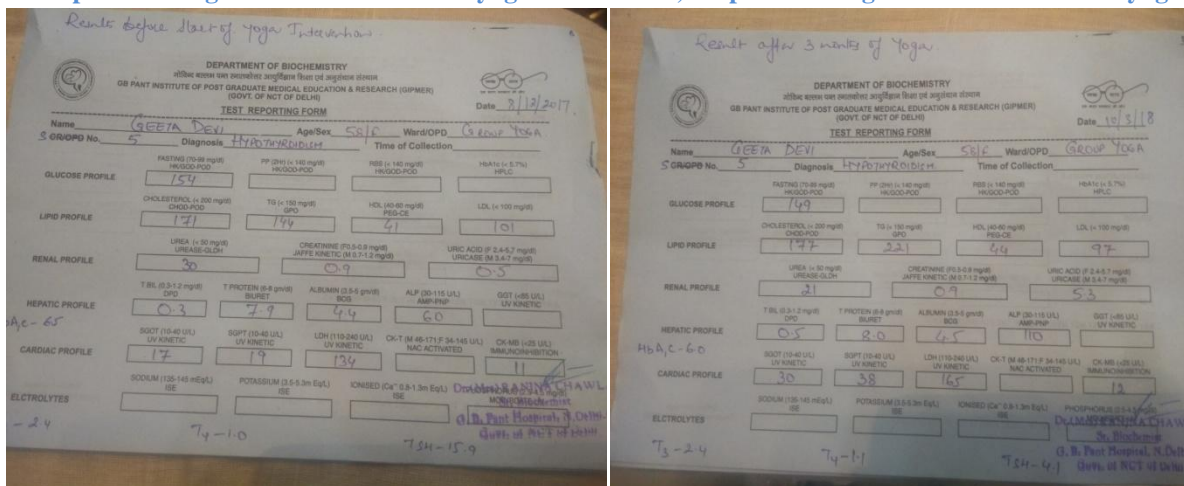
DEPARTMENT OF BIOCHEMISTRY
GB PANT INSTITUTE OF POST GRADUATE MEDICAL EDUCATION & RESEARCH (GIPMER)
(GOVT. OF NCT OF DELHI)

TEST REPORTING FORM
Date: 29/7/2018

Name: ANITA JAINANT KUMAR Age/Sex: 32/F Ward/OPD: Group Yoga
S. GROUP No: 3 Diagnosis: HYPOTHYROIDISM Time of Collection:

GLUCOSE PROFILE	FASTING (70-99 mg/dl) HPGCO-POD: 89	PP (2HR) (140 mg/dl) HPGCO-POD:	RBS (140 mg/dl) HPGCO-POD:	HBA1c (5.7%) HPLC:
LIPID PROFILE	CHOLESTEROL (x 200 mg/dl) CHOD-POD: 181	TG (x 150 mg/dl) GPO: 185	HDL (40-60 mg/dl) PEG-CE: 42.3	LDL (x 100 mg/dl) PEG-CE: 102
RENAL PROFILE	UREA (x 50 mg/dl) UREASE-GLDH: 21	CREATININE (F) (0.5-0.9 mg/dl) JAFFE KINETIC (M) (0.7-1.2 mg/dl): 0.6	URIC ACID (F) (2.4-5.7 mg/dl) URICASE (M) (3.4-7 mg/dl): 4.8	
HEPATIC PROFILE	T.BIL (0.3-1.2 mg/dl) DPO: 0.7	T.PROTEIN (6-8 gm/dl) BIURET: 7.6	ALBUMIN (3.5-5 gm/dl) BCL: 4.9	ALP (30-115 U/L) AMP-PNP: 62
CARDIAC PROFILE	SGOT (10-40 U/L) UV KINETIC: 20	SGPT (10-40 U/L) UV KINETIC: 24	LDH (110-240 U/L) UV KINETIC: 168	CK-T (M) (48-171 U/L) NAC ACTIVATED: 10
ELECTROLYTES	Na ⁺ (135-145 mEq/L) ISE: A70-11.9	K ⁺ (3.5-5.3 mEq/L) ISE: T ₃ -3.3 (NV-2.0-4.4)	Ca ²⁺ (8.8-10.4 mg/dl) ISE: T ₄ -1.2 (NV-0.75-1.3)	PHOSPHORUS (2.5-4.5 mg/dl) ISE: TSH-2.5 (NV-0.4-4.0)

2nd patient Image .4 Before start of the yoga intervention, 2nd patient Image.5 After 3 months of yoga



2nd patient Image.5 After 6 months of yoga

