

ORIGINAL RESEARCH**To Study the Role of Yoga in Physical Wellbeing and COVID Antibody Production in COVID Vaccine Recipients**

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Abstract

Aim: To study the role of yoga in physical wellbeing and COVID antibody production in COVID vaccine recipients.

Material and Methods: The study was conducted on 186 patients, who were randomly allocated to either Group A (Study group or Yoga group) or Group B (control group) for the purpose of the study. Out of them, a fairly large number of patients (176 patients) completed the study. While in Group A (patients undergoing yoga therapy along with dietary restrictions), out of 93 patients who were enrolled, 89 patients (95%) completed 6 months follow up and the rest were lost to follow up; in the Group B (patients on dietary restrictions only), out of 93 patients, 87 patients (91%) completed 6 months follow up, and the rest were lost to follow up. The patients were followed thoroughly and at the end of three months they were measured again for WHOQOL-BREF score, COVID antibody titres, routine investigations along with Blood Pressure and other parameters.

Results: The difference in mean COVID antibody titres between - Yoga Participants (Study Group) and Non- Yoga Participants (Control Group) one and three month after vaccination is significant (p value= 0.003), and, it is higher in Yoga participants group. Also WHOQOL-BREF is higher in Yoga participants group than in non-Yoga participants group, one and three month after vaccination.

Conclusion: From the present study, we found that Yoga therapy is beneficial in increased production of COVID antibodies and overall sense of physical wellbeing assessed using WHOQOL-BREF score. Yoga did not have significant effect in reducing the side effects of COVID vaccination, however, practicing yoga can significantly increase the tolerance of side effects, i.e. those who practice yoga tolerate the side effects better.

Keywords: COVID, Yoga, WHOQOL-BREF

Introduction**Covid (Coronavirus Disease)**

Coronavirus disease 2019 (COVID-19) is defined as illness caused by a novel coronavirus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; formerly called 2019-nCoV), which was first identified amid an outbreak of respiratory illness cases in Wuhan City, Hubei Province, China. It was initially reported to the WHO on December 31, 2019. On January 30, 2020, the WHO declared the COVID-19 outbreak a global health emergency. On

March 11, 2020, the WHO declared COVID-19 a global pandemic, its first such designation since declaring H1N1 influenza a pandemic in 2009.

The following symptoms may indicate COVID-19.

- Fever or chills (43-45%)
- Cough (63-83%)
- Shortness of breath or difficulty breathing (45.6%)
- Fatigue (63%)
- Muscle or body aches (36-63%)
- Headache (34-70%)
- New loss of taste (54.2%) or smell (70.2%)
- Sore throat (52.9%)
- Congestion (67.8%) or runny nose (60.1%)
- Nausea or vomiting (31.6%)
- Diarrhoea (17.8%)

Yoga

The word “yoga” literally means “yoking,” or “joining together” for a harmonious relationship between body, mind and emotions to unite individual human spirit with divine spirit or the True Self. (Prabhupāda, AC, 2001; Stiles M, 2000) Yoga is regarded as a form of mind–body medicine or part of complementary and alternative medicine (CAM) (Shannahoff-Khalsa D, 2004)

- It has been suggested that yoga creates inner, physical and emotional balance using postures (Hatha yoga), called asanas, that are combined with breathing techniques or pranayama that are based mainly on isometric muscle contractions. (Williams K et al, 2009) Yoga has diverse clinical and nonclinical applications attributed mainly to the degree of complexity and multi-dimensionality of influences that are apparent in yogic exercises. (Posadzki P et al, 2009)
- The popularity of yoga has grown tremendously in the past several years. In 2007, yoga was the 7th most used CAM therapy. A growing number of research studies have shown that Hatha yoga can improve strength and flexibility, and may help control physiological variables such as blood pressure, lipids, respiration, heart rate and metabolic rate to improve overall exercise capacity. (Dhananjai S et al, 2013) Yoga is also an easy and inexpensive tool requiring little in the way of equipment or professional personnel, with some studies indicating excellent long-term adherence and benefits.

Aims And Objectives

- To study the role of yoga in Physical Wellbeing in COVID-19 Vaccinated individuals.
- To study the role of yoga in antibody production in COVID- 19 vaccinated individuals.

Material And Methods

This study was conducted on patients who are vaccinated for COVID-19 in Lala Lajpat Rai Memorial Medical College, Meerut. Study will be conducted in a total of 200 patients with following inclusion and exclusion criteria.

- Subgroup A - 93 individuals vaccinated for COVID-19 and practicing YOGA.
- Subgroup B - 93 individuals vaccinated for COVID-19 and not practicing YOGA.

Selection Of Patients

Patients were selected from OPD in Lala Lajpat Rai Memorial Medical College, Meerut. Patients who came for COVID vaccination in Lala Lajpat Rai Memorial Medical College, Meerut were selected for the study.

A detailed information regarding study was given to the patients using banners, pamphlets and oral explanation of the type of study and their role in the study was explained.

They were motivated to participate in the study using pamphlets and banners.

A detailed study proforma and consent form was filled at the time of recruitment which included particulars of the participants, their socio-economic information and detailed physical examination.

A proper informed and explained consent was taken at the time of recruitment.

Sample Size Calculation

Sample Size was calculated using Cochran's Formula for sample size which is as follows-

$$n_0 = \frac{Z^2 pq}{e^2}$$

N_0 = Sample Size,

Z= Z- Score, taken from Z-Score table,

e is the desired level of precision (i.e., the margin of error),

p is the (estimated) proportion of the population which has the attribute in question,

q is $1 - p$.

Z-Score for a Confidence Interval of 95% is 1.96.

Prevalence of COVID vaccinated individuals at the time of study was ~65%.

Margin of Error for this study is 10%.

The calculated sample size came out to be 88.

Total no. of patients recruited for the study was 93, keeping a margin of 5% extra individuals who would be lost to follow up.

Inclusion Criteria

1. Patients within one week of history of COVID vaccination.
2. Age 18-60 years.
3. Patients who give written informed consent.
4. Non-Smoker and Non-Alcoholic.
5. Patients willing to perform Yoga.

Exclusion Criteria

1. No history or documentation of COVID Vaccination.
2. Age < 18 Years.
3. Uncooperative/Unable to provide informed written consent.
4. Irregular yoga practice during the intervention.
5. Any physical deformity which prevents them from doing yoga e.g., paralyzed limb.

Tools And Tests For Data Generation

1. Questionnaire.
2. COVID Antibody titre.
3. Detailed Physical Examination.

Study Design

- Subjects will be screened from patient populations visiting COVID vaccination centre in

LLRM Medical College, Meerut, from January 2021 through June 2021.

- The yoga class was designed by a certified yoga instructor and a physician.
- The program will be carefully illustrated through workshops and subjects will be required to attend at least one yoga class weekly under the supervision of an expert for twenty-four weeks.
- And they will be advised to practice the same yogic practices at home.
- None of the subjects in the yoga group had any earlier exposure to yoga practice. Each yoga session will consist of 10 minutes of dynamic warm-up exercises, 20 minutes of asanas (yogic postures), 10 minutes of pranayamas (breath control exercise), 10 minutes mudra and bandha and 5 minutes of supine relaxation in shavasana (corpse pose).
- Subjects will be given a booklet illustrating the specific pose to help with their independent practice.
- Subjects will also be given a booklet in which they can note dietary compositions, medications taken daily, signs and symptoms, daily blood pressure and information on adherence to yogic practices at home.
- All subjects will be encouraged to see their yoga teacher and investigator regularly.

All patients included in the study will undergo the following evaluation

1. Details of complaints & history.
2. Questionnaire for assessment of physical wellbeing of subjects.
3. Detailed clinical examination.
4. Investigations: COVID antibody titres.

Timings at which assessments would be done

1. Baseline (Day 0).
2. At One month.
3. At Three months.

Results

1. COVID Antibody Titre

Relevant data in terms of mean COVID Antibody Titre, at the baseline, at One month and, at Three months, mean difference and p- value of paired t-test for both groups- Yoga Participants (Study Group) and Non- Yoga Participants (Control Group) is presented in Table 3. This table also presents the p-value of independent t-test at One month and at Three months.

Table 1: Mean COVID Antibody Titre, at the baseline, at One month and, at Three months, mean difference and p- value of paired t-test for both groups- Group- A (Yoga Patients) and Group- B (Non-Yoga Patients).

	Yoga patients		Non-Yoga patients		t-test	p-value
	Mean	SD	Mean	SD		
At Baseline COVID Antibody Titre	5.27	2.07	4.92	1.94	1.176	0.241
At One Month COVID Antibody Titre	50.78	13.72	45.49	12.68	1.699	0.002
At Three Month COVID Antibody Titre	137.39	20.30	128.44	20.00	3.028	0.003

It can be observed from Table 1, that COVID Antibody titres increase after First dose and Second dose of vaccine.

Mean COVID antibody titres in yoga participants and non-yoga participants at baseline are

5.27 and 4.92 (difference= +0.35).

These values when compared using t-test, the value came out to be 1.176 (p-value=0.241), which was statistically not significant, which means the two groups are comparable at the baseline.

One month after First dose of vaccine, there is increase in COVID Antibody Titres in both the groups. The Yoga group has higher mean COVID Antibody Titres (difference= +5.29) and this difference is **statistically significant** (p value= 0.002).

Three months after First dose of vaccine, there is increase in COVID Antibody Titres in both the groups. The Yoga group has higher mean COVID Antibody Titres (difference= +8.95), and, this difference is **statistically significant** (p value= 0.003).

Table 2: Difference in One month and Three months COVID antibody titres when compared with the baseline COVID antibody titres in Yoga Participants (Study Group) and Non- Yoga Participants (Control Group) with p-value.

	Yoga Patients		Non-Yoga Patients		t-test value	p-value
	Mean	SD	Mean	SD		
Difference One Month mean COVID Antibody Titre	47.51	14.16	40.57	13.10	1.472	0.003
Difference Three Month mean COVID Antibody Titre	132.12	20.67	123.52	20.26	2.865	0.005

It can be inferred from Table 2, that the difference in mean COVID antibody titres when compared with the baseline COVID antibody titres between - Yoga Participants (Study Group) and Non- Yoga Participants (Control Group) One month after vaccination is 47.51 and 40.57 respectively (difference= +6.94), and is found to be **statistically significant** (p value= 0.003) and, it is higher in Yoga participants group.

Also, that the difference in mean COVID antibody titres when compared with the baseline COVID antibody titres between - Yoga Participants (Study Group) and Non- Yoga Participants (Control Group) **three months** after vaccination is 132.12 and 123.52 respectively (difference= +8.6), and is found to be **statistically significant** (p value= 0.005), and, it is higher in Yoga participants group.

2. WHOQOL-BREF Score

The WHOQOL is a quality of life assessment developed by the WHOQOL Group with fifteen international field centres, simultaneously, in an attempt to develop a quality of life assessment that would be applicable cross-culturally.

Relevant data in terms of mean WHOQOL-BREF Score, at the baseline, at One month and, at Three months, mean difference and p- value of paired t-test for both groups- Yoga Participants (Study Group) and Non- Yoga Participants (Control Group) is presented in Table 3. This table also presents the p-value of independent t-test at One month and at Three months.

Table 3: Mean WHOQOL-BREF Score, at the baseline, at One month and, at Three months, mean difference and p- value of paired t-test for both groups- Group- A (Yoga Patients) and Group- B (Non-Yoga Patients).

	Yoga patients		Non-Yoga patients		Z	p-value
	Mean	SD	Mean	SD		
At Baseline WHOQOL Score	47.00	5.23	48.00	4.93	-1.342	0.181
At One Month WHOQOL Score	54.00	4.73	47.00	5.23	9.579	0.001
At Three Month WHOQOL Score	59.00	5.53	48.50	4.62	14.046	0.001

It can be observed from Table 3, that WHOQOL-BREF score increase after First dose and

Second dose of vaccine.

Mean WHOQOL-BREF scores in yoga participants and non-yoga participants at baseline are 47 and 48 (difference= -1).

These values when compared using t-test, the value came out to be -1.342 (p-value= 0.181), which was statistically not significant, which means the two groups are comparable at the baseline.

One month after First dose of vaccine, there is increase in WHOQOL-BREF score in both the groups. The Yoga group has higher mean WHOQOL-BREF score (difference= +7) and this difference is **statistically significant** (p value= 0.001).

Three months after First dose of vaccine, there is increase in WHOQOL-BREF score in both the groups. The Yoga group has higher mean WHOQOL-BREF score (difference= +11), and, this difference is **statistically significant** (p value= 0.001).

Table 4: Difference in One month and Three months WHOQOL BREF Score when compared with baseline WHOQOL-BREF score in Yoga Participants (Study Group) and Non- Yoga Participants (Control Group) with p-value.

	Yoga patients		Non-Yoga patients		t- test value	p- value
	Mean	SD	Mean	SD		
Difference at One Month WHOQOL Score (mean) when compared with baseline.	7.00	7.14	-1.00	7.35	7.530	0.001
Difference at Three Months WHOQOL Score (mean) when compared with baseline.	12.00	8.07	0.50	6.87	10.467	0.001

It can be inferred from Table 19, that the difference in mean WHOQOL-BREF Score when compared with baseline WHOQOL-BREF score between - Yoga Participants (Study Group) and Non- Yoga Participants (Control Group) One month after vaccination is 7 and -1 respectively, which is **statistically significant** (p value= 0.001), and, it is higher in Yoga participants group.

Also, that the difference in mean WHOQOL-BREF Score when compared with baseline WHOQOL-BREF score between - Yoga Participants (Study Group) and Non- Yoga Participants (Control Group) three months after vaccination is 12 and 0.5 respectively, which is **statistically significant** (p value= 0.001), and, it is higher in Yoga participants group.

Discussion

- In the present study, we tried to elucidate the role of yoga in Physical Wellbeing and COVID Antibody production in COVID vaccine recipients.
- A study on role of yoga in physical wellbeing conducted by **Satish et al**, 2021 has shown positive effects of Yoga on improvement of health and wellness.
- A study conducted by **Pooja et al**, 2021 in studying role of yoga on effects of yoga on functional capacity and well-being. Mean 6-min walk test distance improved significantly from 361.66 m to 397.66 m and mean perceived exertion score declined significantly from 4.06 to 2.06 showing overall improvement in physical activities. The recovery time was shortened from a mean of 5.33 min to 2.53 min suggesting a definite improvement in their cardio-respiratory fitness levels. Total Sense of well-being score recorded showed significant improvement from 54.8 to 59.7 after yogic training correlating with enhanced mood, feeling of optimism, relaxation, clear thinking, feeling of cheerfulness and improved confidence.
- A study conducted by **Catherine et al**, 2011, exploring the therapeutic effects of yoga and its ability to increase quality of life showed positive results.
- A study conducted by **Fernando B. Polack et al**, in December 2020 on **Safety and**

Efficacy of the BNT162b2 mRNA Covid-19 Vaccine suggested that the side effects of COVID vaccine are similar to other vaccines directed against viral antigens containing mRNA based viral substitutes. The safety profile of BNT162b2 was characterized by short-term, mild-to-moderate pain at the injection site, fatigue, and headache. The incidence of serious adverse events was low and was similar in the vaccine and placebo groups.

- The results of our study are consistent with those of the above-mentioned studies. Our study reveals that, there is significant improvement in COVID antibody titre from baseline to 9-fold after one month of vaccination.
- There is significant improvement in COVID antibody titre three months of after vaccination when compared to one month after vaccination. That is, there is 2.85 times increase in COVID antibody titres.
- There is 26-fold increase in COVID antibody titres when compared between at baseline and three months after vaccination.
- There is 2.8-fold increase in COVID antibody titres when compared between one month after vaccination and 3 months after vaccination.
- The above results hold true for both the groups, i.e, study and control groups.
- When compared between Yoga and Non- Yoga groups, baseline COVID antibody titres are almost similar. One month after vaccination, the difference between COVID antibody titres between study and control group is significant. The titres are more in Yoga participants than in non-Yoga participants and differ by 7.39%. This difference is significant.
- Three months after vaccination, the difference between COVID antibody titres between study and control group is significant. The titres are more in Yoga participants than in non-Yoga participants and differ by 10.08%. This difference is significant.
- The physical wellbeing among the participants is assessed using WHOQOL-BREF questionnaire. The baseline WHOQOL-BREF score is comparable between the study and control groups.
- The participants who did not practice yoga did not have any significant variation in their WHOQOL BREF score over time. Their WHOQOL BREF score was comparable over the time when checked for at baseline, one month and three months after starting yoga practice and vaccination.
- The participants who practised yoga had quite a significant improvement in their WHOQOL BREF score over the time when assessed at baseline, one month and three months after starting yoga practice.
- The difference in baseline and one-month WHOQOL-BREF score was 14.8% increase, which was significant.
- The difference between one month and three months WHOQOL-BREF score was 8.4% increase, which was significant.

Conclusion

From the present study, we found that Yoga therapy is beneficial in increased production of COVID antibodies and overall sense of physical wellbeing assessed using WHOQOL-BREF score.

Yoga did not have significant effect in reducing the side effects of COVID vaccination, however, practicing yoga can significantly increase the tolerance of side effects, i.e, those who practice yoga tolerate the side effects better.

Yoga appears to have holistic effect on overall state of health of an individual and will prove as a useful tool in prevention of adverse effects of vaccination, better tolerance of COVID

symptoms and better management of COVID as a whole. We recommend large scale, multi-centric trials to further authenticate the findings of this study.

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