Impact of Hathayoga on Psychological Wellbeing and Quality of Life in Post-COVID Adults: A Six-Month Controlled Intervention Study

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***Abstract*—Introduction: The Post-COVID syndrome (PCS) provide the neuropsychological and functional impairments, which included the anxiety, depression, sleep disturbances, and cognitive dysfunction. The Chronic inflammation and autonomic imbalance stimulated the symptoms. Limited conventional care indicated the significance for the integrated, non-pharmacological interventions. Hatha yoga supported the psychological recovery to improve the autonomic regulation and the well-being.**

Method: The study was a prospective controlled study which included the 100 post-COVID adults (25–60 years). All of the participants were classified into intervention (Hatha yoga) and control groups. Some of the participants were excluded and 50 patients completed the study. The outcome variables included the BAI, BDI, PSQI, IPAQ, and SF-36. Yoga was conducted for 6 months. SPSS with $p<0.05$ used for statistical analysis.

Results: The baseline parameters were compared across the groups. The intervention group showed high reduction in anxiety (BAI: −6.56 vs −4.74) and depression (BDI: −3.36 vs −1.40). Physical activity (IPAQ: 1770.2 vs 1400.58) and quality of life (SF-36: 18.6 vs 10.12) had improved. Both of the groups showed improvement in sleep quality. Yoga indicated the psychological and functional improvement.

Conclusion: The hatha yoga improved the psychological well-being, physical activity, and quality of life among post COVID patients, and supported the function in the rehabilitation.

***Index Terms*—Post-COVID syndrome; Hatha Yoga; Psychological well-being; Quality of life; Rehabilitation**

I. INTRODUCTION

Post-COVID syndrome (PCS) has caused a major biopsychosocial crisis, resulting in "silent" neuropsychological problems that sometimes have a higher impact than physical problems caused by the virus [1]. Pooled data from around the world shows a high rate of depression, anxiety, and sleep problems in patients with persistent cognitive complaints or “brain fog” [1, 2]. Survivors have been evaluated across time and show that cognitive dysfunction and fatigue can last for up to 15 months, indicating that recovery from the acute viral infection is limited to that period [2]. The persistent nature of the symptoms over time indicates the need for integrated rehabilitation strategies to prevent further decline in self-identity and functional quality of life [2].

Elevation in both interleukin-6 (IL-6) and C-reactive protein (CRP) during continued immune activation post-acute-COVID is associated with the establishment of low-level inflammation that negatively impacts the efficiency of the fronto-subcortical connection leading to activation of microglia within those same areas of the brain [3]. Additionally, neuroinflammation is related to decreased cognitive speed, forgetfulness, and mood instability [3,4]. Meanwhile, autonomic dysregulation with low vagal tone keeps individuals in a hyper-sympathetic state (i.e., fight-or-flight) resulting in symptoms of palpitations and anxiety [4]. These physiological stressors, when coupled with dyspnea from exertion can lead to kinesiophobia, facilitating a bi-directional feedback loop of inactivity and reduction in quality of life [3]. As time continues on, the symptom network progresses from solely respiratory patterns to a chronic multi-system pattern of involvement, wherein ongoing immune signals and autonomic imbalance result in continual neuropsychiatric morbidity [3,4].

The use of long-term medications for the treatment of mental health conditions in patients with post-

COVID may be strongly affected by multimorbidity and polypharmacy. Patients generally describe that they have difficulty with tolerance to medications that activate or sedate them [5]. Furthermore, access to specialized cognitive-behavioral therapy for post-viral conditions is extremely limited. Barriers such as two-year wait times to obtain care, a limited number of dedicated clinics, and the patient routing system that assigns patients to generic services that do not have the ability to provide care demonstrates the need for integrated and non-pharmacological interventions for timely care while maintaining clinical appropriateness [5].

Hatha yoga helps with psychological recovery by using mindfulness, control of breath, and physical movement to modify the autonomic nervous system and cognitive-emotional patterns. The practice of Hatha yoga increases awareness of the present moment, reduces rumination, and rebuilds physical trust in the body [6]. Biologically, Hatha yoga has been shown to increase heart rate variability and vagal tone as measured by increases in high-frequency power and decreases in the low/high-frequency ratio [6,7]. For these neuroplastic changes to become established, a minimum of six months of practice is needed for the body to adapt and transition the autonomic rebalance and anxiety reduction from temporary reactions to stable, long-term coping mechanisms that can be used beyond the initial novelty of exercise [7].

II. METHOD

Research design

The study was a prospective controlled study to evaluate the effect of the Psychological Wellbeing and the life quality among the post-COVID adults. The study was conducted over a six-month period at a tertiary care hospital in Ahmedabad, India. Participants were selected based on their recorded history of COVID-19 and were enrolled in two groups: Group A (intervention group), which received supervised Hatha yoga training, and Group B (control group), which did not receive yoga intervention. The objective of the study is tp identify the impact of the Hathayoga on the level of anxiety, quality of sleep, physical activity and the overall health status. Also the study analysed the association between the benefits regarding the psychological wellbeing and functional recovery, which highlighted the bio-psychosocial model of rehabilitation. Predefined criteria were considered for the patient enrolment.

Inclusion criteria

- Patients with age 25–60 years with past history of COVID 19 were included.
- Persistent symptoms of post-COVID symptoms for 2 to 6 months were included like fatigue, dyspnea, reduced stamina, and difficulty in daily activities.
- Patients without any systemic condition were included in the study.
- Patients without any experience of yoga or meditation were selected for the study.

Exclusion criteria

- Patients with haemodynamically unstable individuals were not considered.
- Patients with severe impairment with regards to cardiac or pulmonary system were excluded.
- Patients with rheumatic, neurological, or severe psychological disorders were not considered.

Sample size

The total sample size selected for the study is 100 patients with COVID positive as confirmed by RTPCR test and were selected based on various inclusion and exclusion criteria. After the initial screening, eligible participants those who met the exclusion and inclusion criteria were selected for the study. Individuals were allocated in the intervention group and the control group. Those who were inconsistent through-out the program due to personal reasons were not allowed for the study. Final 50 samples were selected for the study, those who have completed 6-months Hathayoga training.

Procedure

A total of 100 patients were selected with predefined criteria and were allocated into both of the groups. Different baseline parameters were assessed, which included the distribution of male female, the status of smoking, the level of education whether it is primary, secondary or uneducated and the usage of alcohol. All of the participants were investigated after 6 months of training. The outcome analysis included the psychological screening like Beck Anxiety and

Depression Inventories, Pittsburgh Sleep Quality Index to assess the sleep quality, mMRC scale to measure the severity of dyspnea and IPAQ, to measure the physical work done.

Statistical analysis

SPSS version 27 was used for statistical analysis. The Shapiro–Wilk test was performed for data normalisation. Continuous variables were represented in terms of mean ± standard deviation or median (IQR), while the categorical variables were represented as frequencies and percentages. ANOVA was used for normally distributed data, and the p-value < 0.05 was maintained for statistical significance.

III. RESULTS

Table 1 demonstrated the sample features between the two groups of study. The intervention group and 66% in the control group, highlighted the non-significant p-value of p = 0.679.

Modest variations in the education level as Educational levels showed modest proportional variations. Status of smoking was similar between the groups, showed 58% smokers in the interventional group and 52% in the control, p value was 0.688. Both of the groups showed 68% alcohol consumption, with p = 1.000. These findings confirmed the lack of statistical importance, indicated the comparison between the outcomes.

Table 1: Baseline characteristics of the sample between the two groups and their analysis

Parameter	Intervention Group n (%)	Control Group n (%)	χ^2 test	P-value*
Sex (Female/Male)	30 (60%) / 20 (40%)	33 (66%) / 17 (34%)	0.386	0.679
Educational Level (Graduate / Secondary / Uneducated)	17 (34%) / 10 (20%) / 23 (46%)	10 (20%) / 14 (28%) / 26 (52%)	2.665	—
Smoking Status (No/Yes)	21 (42%) / 29 (58%)	24 (48%) / 26 (52%)	0.364	0.688
Alcohol Use (No/Yes)	16 (32%) / 34 (68%)	16 (32%) / 34 (68%)	0	1

The table demonstrated the improvement in the psychological outcomes, physical examination and the life quality rather than the controls. The reduction in anxiety (BAI) and depression (BDI) was highly noticeable in the intervention group (p = 0.01). Physical activity (IPAQ) and quality of life (SF-36) showed p = 0.01. The Sleep quality (PSQI) had shown improvement in both of the groups with minimal difference between the groups. The findings provided significant outcomes regarding the benefits in psychological well-being and functional status.

Table 2: Mean pre–post change in psychological and wellbeing scores including BAI, PSQI, IPAQ, and SF-36

Parameter	Group	N	Mean	Std. Deviation	Std. Error Mean	t-value	Level of Significance
Change BAI	Interventional	50	-6.56	1.94999	0.27577	0.269	0.01
	Control	50	-4.74	2.44791	0.34619		
Change BDI	Interventional	50	-3.36	2.048	0.28963		0.01
	Control	50	-1.4	2.11891	0.29966		
Change Global PSQI	Interventional	50	-3.82	2.67024	0.37763		0.01
	Control	50	-3.32	1.73134	0.24485		
Change IPAQ	Interventional	50	1770.2	292.694	41.3932	6.449	0.01
	Control	50	1400.58	280.3494	39.6474		
Change SF36	Interventional	50	18.6	3.90708	0.55255	11.435	0.01
	Control	50	10.12	3.49717	0.49457		

IV. DISCUSSION

Recent clinical data from India show that Hatha Yoga has substantial benefits on the psychological wellbeing and quality of life (QoL) of individuals who have survived COVID-19. A randomized control trial with data from 72 survivors demonstrated that 30 days of online yoga significantly reduced the severity of depressive symptoms (effect size [ES] -0.99), anxiety (ES -1.32), and PTSD (ES -1.80); these reductions were even greater when yoga was practiced in conjunction with Ayurvedic medicine. In addition to the improvement of mental health, both general and physical health were also considerably improved (ES 0.63 to 0.93) [8]. Additionally, a multi-centre pilot study indicated that 95% adherence rates were achieved; furthermore, the mental health outcomes improved significantly after 12 weeks of intervention (B 3.49; p=0.054) [9]. Therefore, the evidence supports the use of yoga as an effective and safe intervention for reducing the neuropsychiatric consequences associated with long COVID. [8,9].

Recent studies suggest that Hatha Yoga and Pranayama can significantly improve vagal tone and emotional regulation through sustained autonomic restructuring in Indian populations. It was found that Bhramari or Sheetali Pranayama practiced for 15 minutes twice daily for six months by post-COVID adults produced significant increases in time domain measures of heart rate variability (HRV) such as standard deviation of normal-to-normal (SDNN) and root mean square of successive differences (RMSSD) and pulmonary function (forced vital capacity (FVC) from 3.2 ± 0.5L to 3.7 ± 0.4L; $P < 0.001$) [10]. In addition, acute studies found that just five minutes of nostril-specific breathing produces an immediate increase in SDNN, thus increasing high-frequency power and parasympathetic dominance [11]. These physiological changes result in a reduction of sympathovagal balance (LF/HF) and resting heart rate, thus breaking the cycles of tachycardia and anxiety [10]. Through improving vagal engagement this practice offers a strong physiological buffer against stress and the ability to stabilize emotions and build long-term psychological resiliency [10,11].

Hatha Yoga alleviates the "brain fog" associated with the post-COVID condition by lowering levels of systemic inflammation and optimizing sleep architecture. In a randomized trial of 90 healthcare professionals, participants engaged in tele-yoga three times a week for eight weeks significantly reduced their Pittsburgh Sleep Quality Index score and decreased the level of several markers of inflammation (IL-6; serum cortisol), with medium effect sizes of r=0.3 to r=0.5. The physiological effects of Hatha Yoga reduce neuroinflammation and therefore improve executive function, attention, and working memory [12]. In addition, a randomized study involving 63 hospitalized individuals demonstrates that practicing Breathe Yoga for 10 days, twice daily, resulted in a significant reduction of depression, anxiety, and fear when compared to standard care ($p < 0.001$) [13]. Hatha Yoga creates a lower allostatic load and enhances fronto-subcortical efficiency; therefore, it counteracts cognitive slowing and improves neural network function necessary for the recovery of mental clarity during the post-COVID period [11-13].

A 24-week, Hatha yoga program that consists of 60-minute sessions performed five days per week, has been shown to positively impact the multidimensional quality of life for post-COVID individuals (n=117). The statistical analysis yielded significant improvements in the following WHOQOL domains: Physical (p=0.03), Psychological (p=0.02), Social (p=0.04), and Environment (p=0.006), as well as a decrease in stress (p=0.047). Long-term practice promotes neuroplasticity and reduces oxidative stress levels, as evidenced by the reduction in malondialdehyde (p= 0.03) and increase in glutathione (p=0.02) [14]. Further studies should continue with a specific emphasis on standardising the components of Hatha Yoga, the dose response, and how intensely the sessions occur, and whether remote or in-person delivery will have the greatest effect in achieving maximum adherence and accessibility by stratifying patients based on the type of symptoms, levels of distress using an established core set of outcomes, objective measurements, and adequate follow-up over a minimum of 24 weeks post-assessment [9, 15].

V. CONCLUSION

The study findings demonstrated the Hatha Yoga intervention which improved the psychological well-

being and quality of life. The patients in the intervention group, showed high rate of reduction in the anxiety and depression, with benefits noted in physical activity and overall health-related quality of life ($p = 0.01$). Both of the groups showed minimal difference between them. The results indicated the positive relationship between the high psychological status and the functional recovery.

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