



स्वामी विवेकानन्द योग अनुसंधान संस्थान Swami Vivekananda Yoga Anusandhana Samsthana

Deemed to be University u/s 3 of the UGC Act, 1956

#19, 'Eknath Bhavan', Gavipuram Circle, Kempe Gowda Nagar, Bengaluru – 560 109
ph: 080-2661 2669 | e-mail: info@svyasa.edu.in | www.svyasa.edu.in



Certificate

This is to Certify that the Doctoral Committee confirms that this is an authentic approved copy of the thesis titled “**Evaluation of Therapeutic Efficacy and Mechanistic Basis of Yoga in the Management of Adverse Respiratory Health and Neuropsychological Deficits in Pesticide Exposed Indian Farmers**” submitted by **Vipin Dhansoia** bearing Registration No. Phd/Cat 3/18/Jan 2014.

The Viva-voce examination was conducted on **Friday, 23rd December 2022** through online google meet with session link: <https://meet.google.com/srg-skya-zed>

The committee recommends the award of the PhD Degree.

Dr. Akshay Anand
National Reviewer & Examiner
Professor, Department of Neurology,
Post Graduate Institute of Medical Education &
Research, Chandigarh

Dr. Reddicherla Umapathi
International Reviewer & Examiner
Principal Researcher; Brain Pool Program Fellow
Nano Bioengineering Analysis Laboratory
Department of Biological Engineering, Inha University
Incheon

Dr. Vijaya Majumdar
Guide & Associate Professor
S-VYASA, Bengaluru

Dr. Deepeshwar Singh
Co-Guide & Associate Professor
S-VYASA, Bengaluru

Prof. Sony Kumari
Registrar - Evaluation
S-VYASA, Bengaluru

Prof. Ramesh Mavathur
Dean of Academics
S-VYASA, Bengaluru

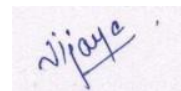
Prof. S. Siva Shankar Sai
Registrar
S-VYASA, Bengaluru

Dr. B. R. Ramakrishna
Vice-Chancellor
S-VYASA, Bengaluru

CERTIFICATE BY THE GUIDE

I hereby certify that the thesis entitled “Evaluation of therapeutic efficacy and mechanistic basis of yoga in the management of adverse respiratory health and neuropsychological deficits in pesticide exposed indian farmers” submitted by Vipin Dhansoia, research scholar, for the award of Doctor of Philosophy in Yoga to the Swami Vivekananda Yoga Anusandhana Samsthana(S-VYASA), Bengaluru, is the result of research work carried out by him in the Anvesana Research Labs, (S-VYASA), Bengaluru under my guidance during the period 2014-2022. Also, this is a record of original work carried out by him in this institution and has not previously formed the basis for the award of any degree, diploma or associateship.

Date: 23/07/2022

A small rectangular stamp containing a handwritten signature in blue ink that reads "Vijaya".


Place: Bengaluru

Research Guide: Dr. Vijaya Majumdar

DECLARATION BY THE RESEARCH CANDIDATE

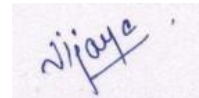
I, Vipin Dhansoia, hereby declare that this thesis title “Evaluation of therapeutic efficacy and mechanistic basis of yoga in the management of adverse respiratory health and neuropsychological deficits in pesticide exposed indian farmers” is the result of Bonafide research work carried out by me at Anvesana Research Labs, Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA), Bengaluru, during the period 2014 - 2022 under the supervision of Dr. Vijaya Majumdar, Associate Professor, S-VYASA, Bengaluru.

I also declare that this research work has not formed the basis for awarding any degree, diploma, associateship, fellowship, or similar titles in this or any other university.



Date: 23/07/2022

Research scholar: Vipin Dhansoia



Place: Bengaluru

Research Guide: Dr. Vijaya Majumdar

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STANDARD INTERNATIONAL TRANSLITERATION CODE

USED TO TRANSLITERATE SANSKRIT WORDS

a	=	अ	ña	=	ऌ	pa	=	प
ā	=	आ	ca	=	च	pha	=	फ
i	=	इ	cha	=	छ	ba	=	ब
ī	=	ई	ja	=	ज	bha	=	भ
u	=	उ	jha	=	झ	ma	=	म
ū	=	ऊ	ñ	=	ञ	ya	=	य
ṛ	=	ऋ	ṭa	=	ट	ra	=	र
ṝ	=	ॠ	ṭha	=	ठ	la	=	ल
e	=	ए	ḍa	=	ड	va	=	व
ai	=	ऐ	ḍha	=	ढ	śa	=	श
o	=	ओ	ṇa	=	ण	ṣa	=	ष
au	=	औ	ta	=	त	sa	=	स
m̐	=	अं	tha	=	थ	ha	=	ह
ḥ	=	अः	da	=	द	kṣa	=	क्ष
ka	=	क	dha	=	ध	tra	=	त्र
kha	=	ख	na	=	न	jña	=	ज्ञ
ga	=	ग						
gha	=	घ						

ABSTRACT

BACKGROUND

The respiratory function and neuropsychological deficits remain major health concerns in chronically pesticide-exposed farmers across the globe. However, there is a scarcity of studies that address the clinical management of these adverse health outcomes of occupational pesticide exposure to farming populations by administering a Yoga-based intervention, which has the potential to improve thoracic compliance and lung function.

AIM AND OBJECTIVES

We aimed to investigate whether Yoga-based intervention could mitigate the effects of chronic exposure to pesticides on respiratory and cognitive functions. Secondly we also aimed to test if oxidative stress reduction could underlie the intervention's impact on the health outcomes, health-related quality of life (HRQOL), and oxidative stress markers in farmers chronically exposed to pesticides.

METHODS

In the present study, we report the findings of parallel two-armed randomized clinical, blinded outcome assessors that tested the efficacy of a yoga-based intervention on pulmonary and cognitive functions in pesticide exposed male farmers. Farmers were screened on their self-reported history of at least six months of spraying operations in the field. Of 634 farmers screened across five villages, 140 male farmers (mean [SD] age, 38.75 [7.50] years) with mean pesticide exposure of 5.71 years (SD 3.04) were included and randomized to yoga (n = 70), or waitlist control arm (n = 70). Yoga intervention was delivered in 60-minute groups for 12 weeks.

A total of 123 participants completed the post-intervention assessment. Analysis was by intention-to-treat. The intervention was unblinded, but the outcome assessment blinded the treatment assignment. The primary outcome was a change in pulmonary function parameters (percent predicted value of FVC, FEV1, %FEV1/FVC, PEF, and FEF 25–75%) after 24 weeks of intervention. Secondary variables were assessed using neuropsychological assessment TMT (Trail making test), DSST (Digit symbol substitution test), WHO Quality of life-BREF, and Perceived stress scale. We present an application of the causal inference approach to mediation analysis. Linear regression was used to analyze study outcomes as adjusted mean differences (AMDs), additionally adjusted for their comparable value at baseline. Mediation analysis was also done considering oxidative stress markers as potential mediators. This study is registered with ClinicalTrials.gov, number CTRI/2019/11/021989.

RESULTS

At the end of 6 months of intervention, the overall follow-up in the participants was 87.85% (n=123); 90% (n=63) in the control group, and 85.71% in the yoga group (n=60). The mean age of the study cohort (n=140) was 38.75 (SD =7.50) years. Compared with the control group, at 24 weeks post-intervention, the breathing focused Yoga group had significantly improved the markers of airway obstruction, after adjusting for confounders, FEV1, FVC, FEF25-75 [z score-adjusted mean differences (95% CI); 1.66 (1.10-2.21), respectively. A fraction of FEF25-75 change (mediation percentage 23.95%) was explained by glutathione augmentation. There were also significant improvements in cognitive scores of DSST, TMT-A and TMT-B, and WHOQOL-Bref.

CONCLUSION

In this 24-weeks randomized controlled trial on chronically pesticide exposed farmers, breathing focused yoga intervention was significantly more effective than the wait-list control group in the alleviation of spirometry-based indices of airflow limitation and cognitive decline. A significant mediating effect of glutathione augmentation was also observed concerning the effect of the intervention on FEF25-75%. These findings provide an important piece of beneficial evidence of the breathing-based yoga intervention that needs validation across different farming ethnicities.

Trial Registration

Clinical Trial Registration Number: CTRI/2019/11/021989

Keywords: Farmers, Pesticide exposure, Breathing-focussed Yoga Intervention, Respiratory Decline, Cognitive Decline

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