


An Application of *Yagna Pathy*: A Spiritual, Cost-Effective, Indigenous Low-Intensity Psychological Intervention to Manage Common Mental Disorders: A Cross-Sectional Pilot Study in India

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Abstract

Elements of Common Mental Disorders (CMD) like stress, depression and anxiety are significant contributors to the global burden of disease. Even though they affect people at all socioeconomic levels, most of those in the low-income and middle-income populations lack access to efficient psychological and pharmaceutical interventions. One potential solution to this issue is the application of indigenous low-intensity psychological interventions like *Yagna Pathy*. The current cross sectional pilot study includes a total of 426 heterogeneous group of people suffering from Stress, Anxiety and Depression (both in normal and diseased range) received *Yagna pathy* for 30 days. The severity of the stress, anxiety and depression was evaluated using a validated depression, anxiety, and stress (DAS) score questionnaire. A significant association (chi square, $p < 0.001$) was found between the mental healing with gender and activity status of the participants. Strong inter-correlation ($R^2 > 0.7$; $p < 0.001$) among features of stress, anxiety and depression also proved the manifoldness of the CMD. Improvements in DAS scores demonstrate the effectiveness of a well-directed *Yagna* practice maintained for a predetermined amount of time in managing stress, anxiety, and depression. The receiver operating characteristic (ROC) of the responses was also found to be “excellent”. Therefore, the study showcased that indigenous practices like *Yagna Pathy* could effectively minimize the severity of CMD. This approach is non-medicated, non-invasive, and cost-effective, making it a practicable therapy for global implementation.

Keywords

stress, anxiety, depression, *Yagna Pathy*, *Hawan*, psychology, India

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Introduction

According to WHO, Common Mental Disorders (CMD) were ranked the second and sixth main causes of illness and are considered a global burden.^{1,2} Anxiety and depression are the two major symptoms that make up the majority of CMD. This neurotic and nonpsychotic affective disorder is designated as “common” because they are widely prevalent in the community and primary care.³ Stress, which is characterized as any form of change that creates physical, mental, or psychological strain, intensifies this further. Still, Mental health is most neglected aspect of public health provision.⁴ The pandemic has rendered mental health conditions much worse.⁵ The COVID-19 pandemic, one of the global catastrophes of the present generations, has had profound and far-reaching effects on the physical and mental well-being of humankind. The pandemic disrupted people’s mental peace for at least two years, and its effects

continue to the present day.⁶⁻¹⁰ During the period billions of people have perished or lost their jobs. Communities and families have become strained and fractured. Young people have been denied the opportunity to learn and interact with others.

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Companies have filed for bankruptcy. Millions of individuals are living in poverty to date.¹¹⁻¹³ Above all, as of 29th September 2022, 65.4 lakh people have lost their lives.¹⁴ Therefore, the consequences retain a long-lasting effect on the mental wellness of people. The evidence of the same can also be perceived by both cross-sectional¹⁵⁻¹⁸ and longitudinal investigations,¹⁹⁻²¹ that have looked at the psychological effects for patients. Studies have shown that those who have been quarantined have a higher prevalence of psychological symptoms, emotional disturbance, melancholy, stress, mood swings and irritability, sleeplessness, post-traumatic stress symptoms, hostility, and emotional exhaustion. Notably, other psychological reactions to quarantine include fear, rage, anxiety, insomnia, perplexity, grief, and numbness.²²⁻²⁴ A delayed return to normalcy even months after the quarantine as well as long-term behavioral modifications like attentive handwashing and avoiding crowds were also documented. Anxiety and trepidation have a big impact on everyone in society. According to recent studies, those who are quarantined or kept in isolation exhibit higher than usual levels of tension, wrath, perplexity, and worry.^{6,12,25,26} In general, every study that has examined the psychological disorders during the COVID-19 pandemic has discovered that those affected show a variety of signs of mental trauma, such as emotional distress, depression, stress, mood swings, irritability, insomnia, attention deficit hyperactivity disorder, post-traumatic stress disorder, and anger.^{8,16,21} Additionally, research indicates that exposure to unfortunate news about Covid-19 in the media regularly had a significant impact on mental tranquility.²⁷⁻²⁹ The present lockdown in India appears to have a diverse impact on many individuals based on their sex, occupation, socioeconomic status, or place of residence, among other factors.³⁰⁻³³ According to the World Bank Report of 2021, nearly 1 billion people live with a mental disorder and more than 75% of people with the disorder do not receive treatment.^{5,14} Thus, it is considered a burden, especially for middle- and lower-income countries.

Various interventions were prescribed to reduce mental illness during this time. Integration of conventional medicines with indigenous therapies is being advised by experts to tackle the consequences of the Covid-19 pandemic.³⁴⁻³⁸ Performing *Yagna Pathy* or *Hawan* in the household is one such noble indigenous method. In India, *Yagna* is considered a spiritual practice for well-being of mostly in Hindu families from ages³⁹ however it has also been applied as a mental health improvement from Vedic period.^{40,41} *Yagna* as a therapy for psychological ailments provides pulmonary inhalation of medicinal smoke of multiple herbs (generated through oblation in fire along with chanting of Vedic hymns), which has the potential for therapeutic results.^{39,42} According to existing knowledge, the best drug delivery methods for brain-related illnesses are nasal drug administration systems.⁴³⁻⁴⁶ Thus, inhaling the smoke originating from *Hawan* must have a positive impact on neurological well-being. The specific shape and size of the Agni-Kunda (Energy Field), the arrangement of wood pieces in it, and the time-frequency and amount of ingredients used in *Hawan* account for controlled chemical processing in the fire and lead to sublimation, chemical conversion and/

or transformation into vapor phase of the herbal/plant medicinal preparation leading to release the smokes of medicinally important phytochemicals.⁴⁷⁻⁴⁹ The reference to the effectiveness of *Yagna* has been documented in ancient literature in Indian medicine. *Acharya Charak* has indicated in *Charak Samhita* to perform *Yagna* for peace of mind and cleaning of the environment in pandemic conditions to calm mental disturbance due to fear, stress, and anxiety.⁵⁰ The effect of rhythmic Vedic hymns and inhalation of medicated fume create a feeling of peace and happiness in them, and the environment also get fresh and calm as stated in Veda and other Ayurvedic literature.³⁹ In support of the above, contemporary studies showed the binding property of the ingredients of herbal smoke with CB2 receptors, responsible for anxiety disorders.⁵¹ Furthermore, the components of *Yagna* seem to have multiple actions in preventing anxiety through scavenging free radicals, increasing in level of antioxidants, and other underlying mechanisms.^{47,48} Similarly, generation of the electromagnetic waves during performing *Yagna* could alleviate psychological depression.⁵² Apart from that the anti-microbial, antioxidant, immune protective and air cleaner role of herbal smoke released from *Yagna* is also evident in the literature.^{48,49,52,53} Although several studies could provide indirect indications regarding the psychoneurological effect of *Yagna*, a gap regarding the validation of the same still exists. Earlier studies have tried to justify the same, but the size of the sample is too less to be significant.⁵⁴⁻⁵⁶

With the perspectives in mind, the current study seeks to examine the levels of anxiety, stress, and depression among self-reporting patients during the COVID-19 outbreak and determine whether performing *Yagna* as a form of intervention will help to control the disorders. As the present study falls under observational study (Cross-sectional) we have followed STROBE guidelines⁵⁷ to conduct the same.

Material and Methods

Study Design & Participants Recruitment

This present study contains a cross-sectional design. Five hundred and twenty health-seekers suffering from different common mental conditions (Stress, Depression, and Anxiety) initially approached Patanjali YogGram, Haridwar, India (Latitude: 28.64739 Longitude: 77.19265) for the treatment purpose. Patanjali YogGram in Haridwar is a renowned research facility devoted to the scientific study and use of naturopathy, yoga, and Ayurveda. This institution, which combines modern scientific research approaches with ancient Indian healing practices, is situated in a serene area close to Haridwar, Uttarakhand. The center provides a favorable setting for in-depth investigation and study into the therapeutic, psychological, and physiological advantages of Ayurvedic and yoga medicine. Comprehensive facilities, including treatment rooms, lecture halls, and specialized laboratories, are beneficial to both researchers and practitioners, fostering multidisciplinary collaboration and the growth of evidence-based holistic health methods. Overall, Patanjali YogGram is an organization that aspires to contribute to the field of local and worldwide health research.

In regard of accessing the treatment effectivity, the patients were requested to fill out the DASS-42 form before and after the intervention (treatment) process. To check the level of anxiety, stress, and depression

both pre- and post-intervention online questionnaires using the Depression Anxiety Stress Scales (DASS) scale^{58,59} distributed through Google Forms.

The Depression, Anxiety, and Stress Scale (DASS) was selected for this study due to its comprehensive assessment of depression, anxiety, and stress (DAS) symptoms, which aligns with the multidimensional nature of mental health issues encountered in community settings. The DASS is well-established for its robust psychometric properties across diverse populations and cultural contexts, offering a reliable and sensitive tool for evaluating psychological distress. Its brevity, ease of administration, and validated scoring protocols further enhance its suitability for large-scale community-based studies, ensuring efficient data collection and rigorous analysis of interventions aimed at managing CMD.^{60,61} DASS-42 consists of 42 items in three categories namely DAS. Question number 3, 5, 10, 13, 16, 17, 21, 24, 26, 31, 34, 37, and 42 are regarding depression, Question number 2, 4, 7, 9, 15, 19, 20, 23, 25, 28, 30, 36,

40, and 41 are for anxiety and question number 1, 6, 8, 11, 12, 14, 18, 22, 27, 29, 32, 33, 35, and 39 are for stress. A categorization of the different dimensions is obtained by summing up the scores on the answers to the items that correspond to each of the variables. The choices available to react to this scale were: 0: did not apply to me at all; 1: applied to me to some extent or some time; 2: applied to me to a significant degree or most of the time; and 3: applied to me a great deal or most of the time; The severity ratings used to interpret are shown in Table 1.^{58,59} All Questionnaires were conducted in British English.

Among the responses obtained, the inclusion criteria were applied, selecting only those participants who completed the full duration of the intervention. No external medications or interventions other than Yagna Pathy were used during this period. Consequently, 426 participants (86%) were included in the study. The study design is summarized in Figure 1. All of the participants in the study at Patanjali YogGram, Haridwar, identified as Hindu, which is consistent with the cultural setting where customs such as Yagna Pathy are traditionally followed. Although there were no constraints on religion, caste, or creed in the study, it is acknowledged that the participants' acceptance of Yagna Pathy had its roots in Hindu beliefs. The research was conducted with strict adherence to ethical principles, having received approval from an institutional review board. Procedures for obtaining consent were created with clarity and consideration for participants' religious beliefs in mind. The participants who are taken into consideration are those who voluntarily engage in the process. This method emphasizes a dedication to moral behavior and consideration for cultural diversity in the research setting.

Table 1. DASS Scale.

Severity	Depression (DASS-A)	Anxiety (DASS-A)	Stress (DASS-S)
Normal	0–9	0–7	0–14
Mild	10–13	8–9	15–18
Moderate	14–20	10–14	19–25
Severe	21–27	15–19	26–33
Extremely severe	28+	20+	34+

Adopted from⁵⁸

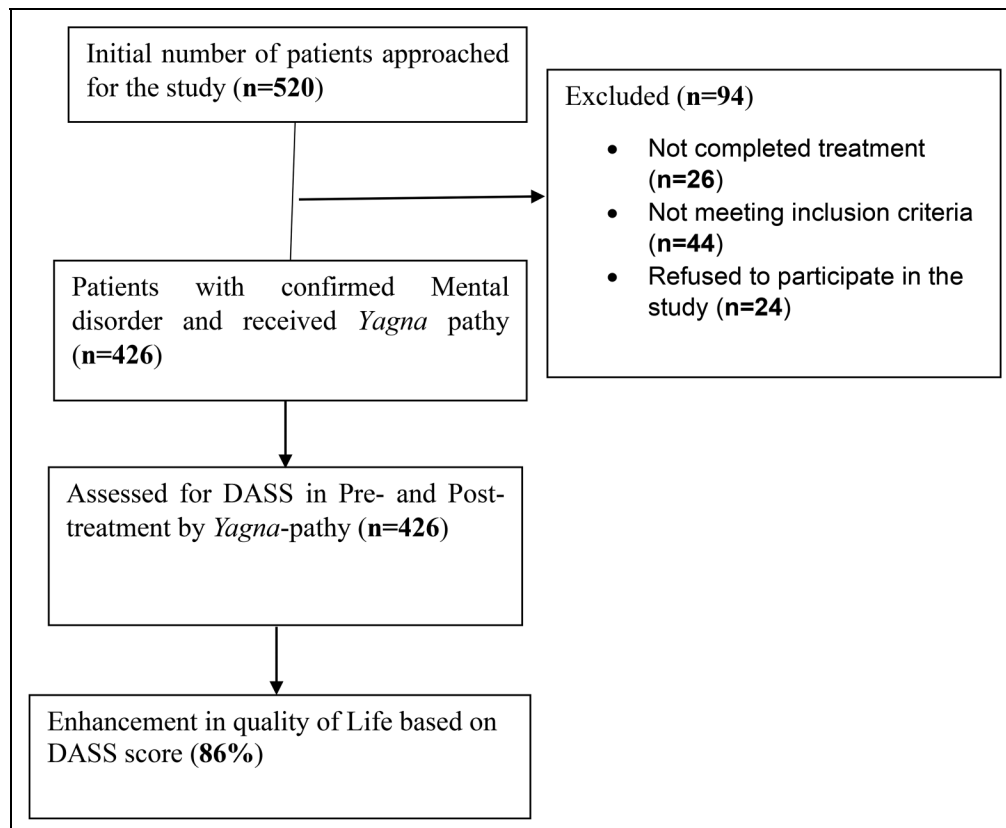


Figure 1. Design of participants recruitment for the study.

Sample Size Validation

A sample that is larger than necessary will be a better representative of the population and will hence provide more accurate results. However, beyond a certain point, the increase in accuracy will be small and hence not worth the effort and expense involved in recruiting the extra patients. Therefore, the minimum number of samples required to get statistically significant results is of utmost importance before conducting a study. Here to find the minimum sample size, we set up the statistical constraints like a 5% margin of error, 50% population proportion, and a confidence interval was 95%. Initially, we received a total of 520 applicants for the study, the population size was set up as 520. Thus, according to the formula stated below.

$$n' = \frac{n}{1 + \frac{z^2 \times p^{\wedge}(1 - p^{\wedge})}{\epsilon^2 N}}$$

The calculated minimum sample size to meet the above statistical constraints was 222. Here z is the z score that is 1.95 at a 95% confidence interval; ϵ is the margin of error (5%); N is the population size (520) and p^{\wedge} is the population proportion (50%). Therefore, our selected sample size (426) proved to be sufficient to obtain a statistically significant result.

Yagna Pathy: The Intervention

The group of experienced experts in perfuming *Hawan or Yagna* used to guide the participants to do it correctly. The materials used for performing *Hawan* were A simple Havan Kund, one bundle of mango or any other suitable wood / Dry cow dung (Keep aside three individual wood sticks as “Samidha”), Some Camphor, 250 g Pure *Hawan Samagree*, 250 g Ghee (Melted), Some Sweet Rice, a container with fresh water and a teaspoon, Matches/Fire lighter, A lamp to be placed in front of the *Havan kund* and the *Havan Samgri*.

As described in the book “*Sankshipt Gayatri Hawan Vidhi*” by Pt. Shriram Sharma Acharya, *Yagya* was performed.⁶² This study was conducted in a big room surrounded by four walls and two windows for ventilation. Also, the four walls were coated with cow dung along with the *Yagya Kunda* (fire pit). The four participants were made to sit on the four sides of the *Kunda*. *Yagya* was performed in the morning during the time of sunrise with special herbal powder available from Patanjali, Haridwar, India. Dried Cow dung patties of the indigenous breed were used as *samadhi* (firewood) and the fire pit used was made of clay and bricks. The mantras used were the *Surya Gayatri mantra* and the *Chandra Gayatri mantra*, with 12 oblations of both mantras. The procedure was conducted for 45 min daily for 30 days.

Ethical Approval

The ethical committee has approved the study as a part of project no. **PAC/IEC/2022/11/37** entitled “*Attitude towards integrated pathy as a questionnaire-based observational study for the assessment of patients vising Patanjali wellness, Haridwar for their improvement and chemical-acceptance towards integrated pathy*”. Here we are reporting a retrospective study of medical records, and all data were fully anonymized before accessed them.

Statistical Analysis

The continuous variables of the study are presented in mean \pm standard deviation and categorical variables were presented in frequency (%).

For sample representativeness, the participants were compared concerning substance use and sociodemographic characteristics using Chi-Square(χ^2) test. In all cases, the data were analyzed for normality using the Shapiro–Wilk Test and considering the skewness and kurtosis values before the application of the hypothesis testing.

For hypothesis testing, a two-sample two-tailed z -test is used to compare the means of Stress, Depression, and Overall DASS scores in Previous and the Post-intervention. So, if the mean score of the samples (both patients and normal) before the *Yagna* is μ_1 and after *Yagna* is μ_2 . Then the null hypothesis (H_0) was set as “The performance of *Yagna* does not affect reducing the Stress, Depression and Anxiety disorders” that is $\mu_1 = \mu_2$. The alternative hypothesis (H_1) was “The performance of *Yagna* has a definite effect on reducing the Stress, Depression and Anxiety disorders” that is $\mu_1 \neq \mu_2$. For this study, we have taken α as 5%. Thus, if the $p < \alpha$ then only the alternative hypothesis would be accepted. The overall approach of hypothesis testing, and empirical formula of the z test has been adopted from study of Ghosh and coworkers in the year 2013.^{5,63}

The association among the CMD (stress, anxiety, and depression) with each other was found by the linear regression of the DASS scores with an estimation of person correlation and goodness of fit values.

The discriminative accuracy of the DASS was evaluated by the receiver-operating characteristic (ROC) curve analysis.⁶⁴ A ROC curve plots the sensitivity and specificity at each consecutive threshold value. The area under the ROC curve (AUC) is a suitable parameter to summarize the overall discriminative value of a screening instrument. A value of 0.70 or more can be interpreted as reasonable, 0.80 up to 0.90 as good, and 0.90 or over as excellent.⁶⁴⁻⁶⁷ Regarding the performance of all the statistical methods and plotting graphs, we have used GraphPad Prism (Ver 8) and MS EXCEL.

Results

Socio-Demographic Profiling of the Participants

Before performing *Yagna Pathy*, the total DASS scores (DASS-D + DASS-A + DASS-S) of 87 participants among 426 patients were found on or below 30. This implies that the said participants were under the “*Normal range*” according to the specified DASS table (Table 1). Similarly, the rest of the 339 patients were found to be in the diseased range (mild/moderate/severe/ extremely severe) of CMD. The above pre-screening of patients aids the study in two ways. First, we can identify the diseased range, thus the effect of the intervention on the said range can be clarified. Secondly, the effect of *Yagna Pathy* on the mental situation of normal-range patients could also be explored.

The internal Consistency measurement (Cronbach alpha value), for DASS-S, DASS-D, and DASS-A scores were found to be 0.71, 0.70, and 0.79 respectively for the present study, and the overall DASS score was found to be 0.737. All the values were acceptable according to the previous studies.⁶⁸

In this study, the mean age of the participants was 42.15 (± 12.81) years. The females and male participants were 258 (60.56%) and 168 (39.44%) respectively. There were 328 (77%) participants who are married, and 98 (23%) participants are unmarried. Only 12 (2.82%) participants have habits of

smoking, and 414 (97.18%) participants were non-smokers. 407(95.54%) participants are non-alcoholic, and the rest were 19 (4.46%) participants were alcoholic. 166 (38.97%) participants reported having medication intake for different lifestyle diseases while 260 (61.03%) participants were not using any medication. The activity status of participants is light, moderate, sedentary, and vigorous with 40 (9.39%), 323 (75.82%), 13 (3.05%), and 50 (11.74%) respectively (Table 2).

To get a more comprehensive insight regarding the demographic features with different elements of mental disorders, we have further divided the categorical data into stress, anxiety, and depression level. In the case of stress, anxiety, and depression category, a maximum number of participants are in the 35 to 52 age group. Among them, the Number of Patients under Diseased Category is dominated on the number of patients under normal category. But we found no significant difference among the age groups with stress, anxiety, and depression disorders. Thus, with age, mental illness is not associated according to the Chi-square test ($p > 0.05$). We find a similar result in the case of Marital status, Alcohol intake, medication intake, and smoking habits. While in the case of gender, we only found a significant association with anxiety. There was a significant association ($p < 0.01$) between anxiety, stress, and

depression with daily physical activities. Both diseased and normal categories follow the same association (Table 2).

Association Between the Attributes of CMD

In the current study, we have encountered patients who have stress or anxiety or depression, or any of the two or all three mental illnesses. Thus, this is obvious to probe whether there is any relation between these three mental illnesses.

The regression analysis shows the linear relationship between stress and anxiety; anxiety and depression and between depression and stress (both previous and post-performing *Yagna Pathy*). Moderately strong association ($R^2 > 0.7$; $p < 0.001$) reflect in each case (Figure 2). This strongly suggests that if someone is suffering from stress then he would have a higher possibility to develop both depression and anxiety with vice versa.

Effect of Intervention: Yagna Pathy

The effect of the intervention that is *Yagna Pathy* on relieving mental illness was found by comparing the mean scores of Stress (DASS-S), Anxiety (DASS-A), and Depression (DASS-D)

Table 2. Socio-Demographic Profiling of the Participants.

Demographic Parameters	Stress (DASS-S)			Anxiety (DASS-A)			Depression (DASS-D)		
	Number of Patients under Normal Category (0–14) [#]	Number of Patients under Diseased Category (15–34+) [#]	Chi-Square (df)	Number of Patients under Normal Category (0–7) [#]	Number of Patients under Diseased Category (8–20+) [#]	Chi-Square	Number of Patients under Normal Category (0–9) [#]	Number of Patients under Diseased Category (10–28) [#]	Chi-Square (df)
Age Group									
17–34	34	99	0.46(2)	57	74	0.46(2)	30	101	0.91(2)
35–52	55	135		90	102		53	139	
53–70	29	74		45	58		26	77	
Gender									
Male	52	116	1.46(1)	87	81	5.05(1)*	42	126	0.05(1) 0.82
Female	66	192		105	153		67	191	
Marital Status									
Married	92	236	0.08(1)	147	181	0.03(1)	87	239	0.7(1) 0.40
Unmarried	26	72		45	53		22	76	
Smoking habits									
Yes	6	6	3.06(1)	6	6	0.12(1)	4	8	0.38(1) 0.53
No	112	302		186	228		105	309	
Alcohol intake									
Yes	5	14	0.01(1)	10	9	0.45(1)	4	15	0.21(1) 0.63
No	113	294		182	225		105	302	
Medication Intake									
Yes	49	117	0.48(1)	70	96	0.92(1)	45	121	0.33(1) 0.57
No	69	192		122	138		64	196	
Daily Activity Status									
Light	10	30	10.53(3) *	13	27	15.37(3)	7	33	15.56(3)
Moderate	73	250		142	181	0.002**	75	248	0.001**
Sedentary	3	10		7	6		3	10	
Vigorous	22	28		35	15		24	26	

Significant association at *95% Confidence Interval; **99% Confidence Interval; #According to the DASS scoring table.

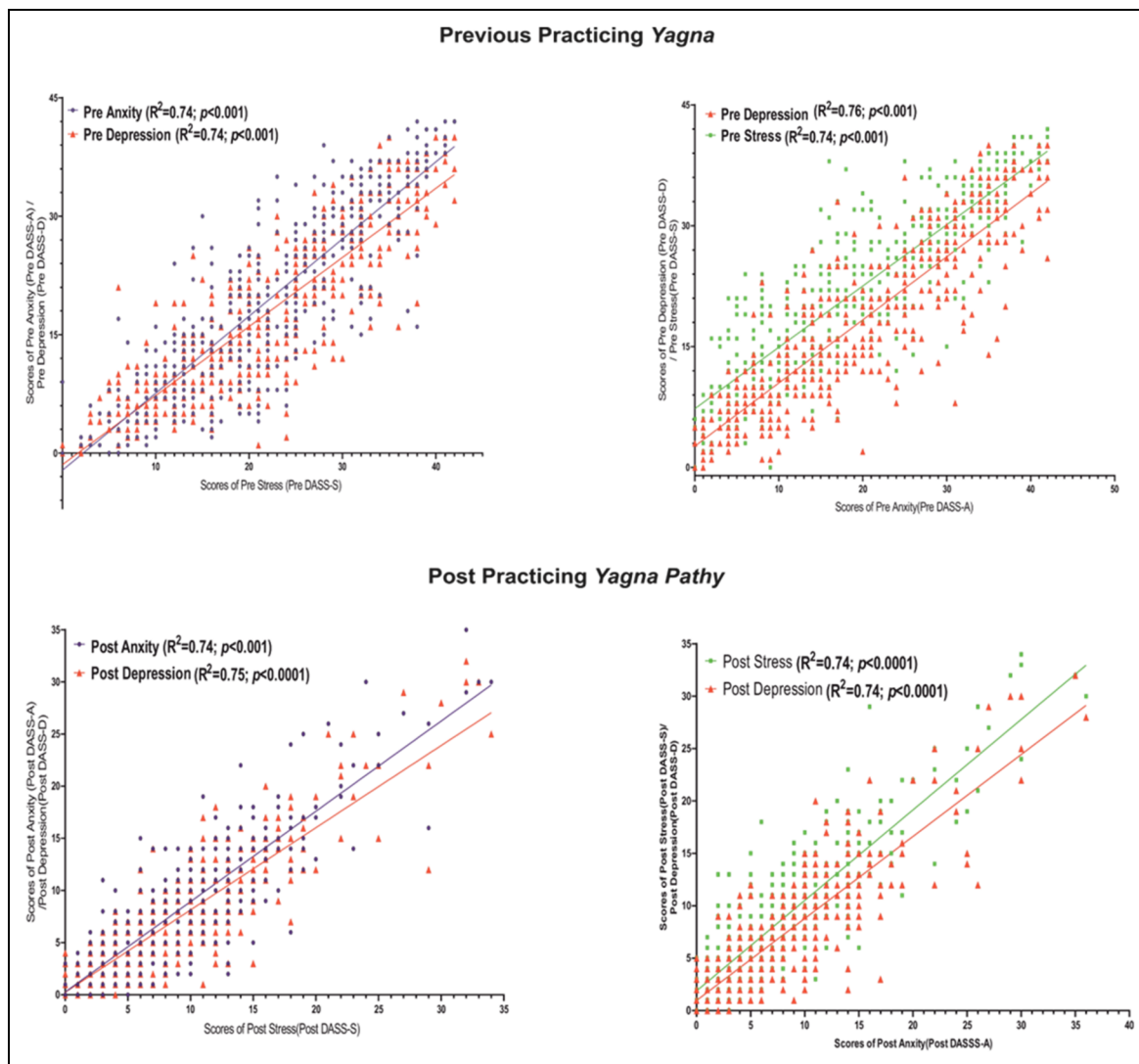


Figure 2. Association among stress, anxiety, and depression.

previous and post-performance of *Yagna Pathy*. To validate or observe the holistic effect, we have only selected participants who have completed the full course of *Yagna Pathy*. According to the results obtained, the mean scores of stresses, anxiety, and depression for the participants in the diseased group have significantly ($p<0.001$) reduced by 60.8%, 60.3%, and 61.9% respectively. The overall DASS score has been reduced by 60.8% among the said group of participants (Figure 3; Table 3).

This observation led us to investigate the effect of *Yagna Pathy* on the participants who are classified into the normal category. The *Yagna Pathy* also proved to retain a profound effect on the reduction of stress, anxiety, and depression in the previous manner (Figure 4) for diseased category. In this case, a 66.6% reduction was observed in DASS-S and 57.8% in DASS-D while 63.3% in the case of DASS-A. The overall DASS score of the participants under the Normal category has been reduced by 62.5% (Figure 4; Table 3). The difference between the pre- and post-mean scores was also found to be significant at a 95% confidence interval calculated by a two-tailed z- test.

Reliability Test

Receiver operating characteristics (ROC) is a crucial tool in reliability analysis that plays a significant role in measuring the accuracy and effectiveness of diagnostic tests. The ROC curve provides an opportunity to evaluate the trade-off between true positive rates (sensitivity) and false positive rates (1-specificity) over a range of test thresholds. To determine the cut-off values giving the best balance between sensitivity and specificity, ROC curves were computed (Figure 5A-5C).

This yielded statistically significant areas under the ROC-curves for DASS-S (AUC 0.93, 95% CI 0.92–0.95; $p<0.001$) in predicting stress, DASS-A (AUC 0.89, 95% CI 0.86–0.91; $p<0.001$) in predicting anxiety and DASS-D (AUC 0.88, 95% CI 0.86–0.91; $p<0.001$) in predicting depression. The overall DASS score (AUC 0.92, 95% CI 0.91–0.94; $p<0.001$). According to the AUCs, the overall discriminative value of the DASS-S, DASS-A, and DASS-D subscale as well as the overall DASS can be interpreted as “excellent”.

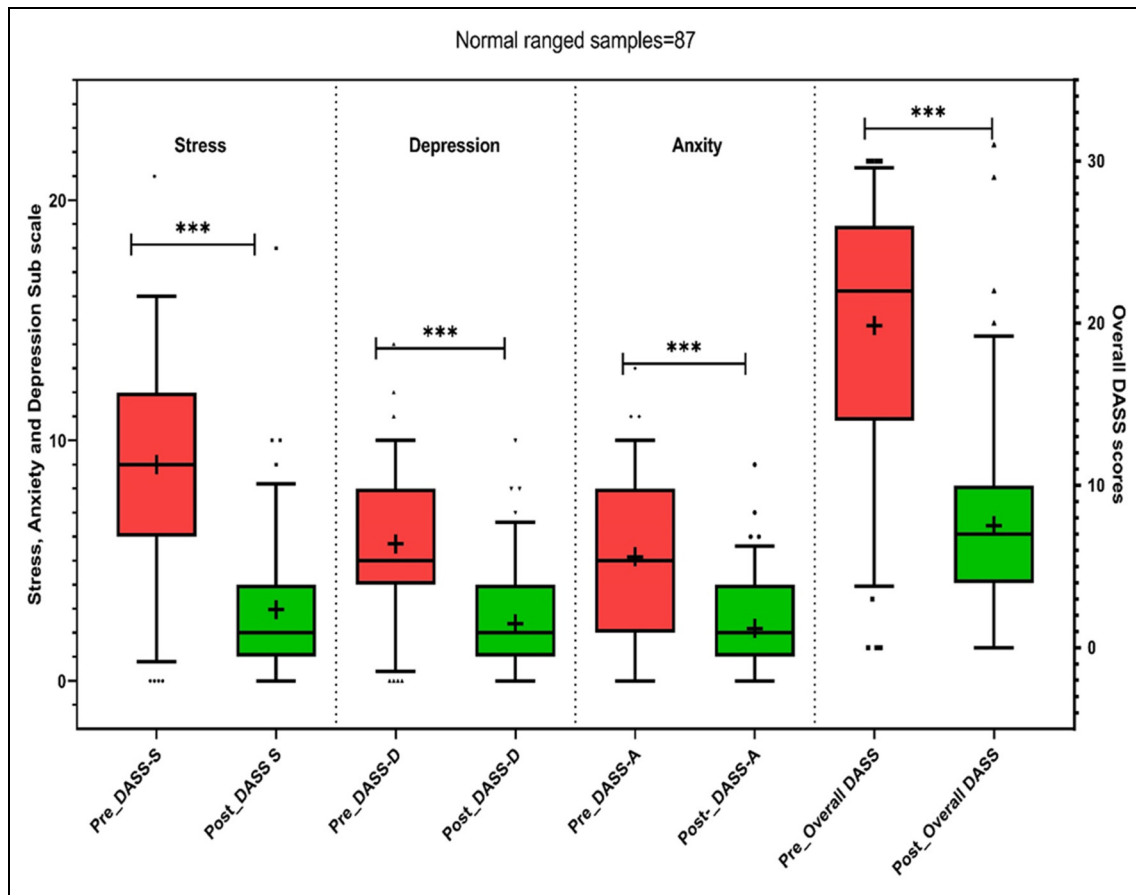


Figure 3. Effect of Yagna Pathy on Mental illness of patients under normal category.

Table 3. Effects of Yagna Pathy on Mean Scores of Depression (DASS-D), Anxiety (DASS-A), and Stress (DASS-S) Scales.

Mental Conditions Parameters	Participants under the Normal Category			Participants under Diseased Category		
	Mean Score Before performing Yagna pathy (\pm SD)	Mean Score After performing Yagna pathy (\pm SD)	Two-tailed z-test score	Mean Score Before performing Yagna pathy (\pm SD)	Mean Score After performing Yagna pathy (\pm SD)	Two-tailed z-test score
Stress (DASS-S)	9 (\pm 4.1) [#]	3 (\pm 2.8) [#]	11.28***	25 (\pm 8.2) ^{\$}	9.8 (\pm 6) [#]	28.10***
Depression (DASS-D)	5.7 (\pm 3) [#]	2.4 (\pm 2) [#]	8.65***	21 (\pm 9) ^{\$}	8 (\pm 5.6) [#]	22.28***
Anxiety (DASS-A)	5.2 (\pm 3.1) [#]	2.2 (\pm 1.9) [#]	6.64***	23 (\pm 9.7) ^{\$}	8.9 (\pm 6.1) [#]	22.38***
DASS-Score	20 (\pm 7.8) [#]	7.5 (\pm 5.8) [#]	11.82***	69 (\pm 25) ^{\$}	27 (\pm 17) [#]	25.84***

*** $p < 0.001$ (Significant at 99% confidence interval); #Scores denotes the NORMAL condition of Mental Disorders; \$Scores denotes SEVERE/MODERATE condition of Mental Disorders according to the DASS scoring table.

Discussion

The present study could open different avenues regarding mental wellness. First, common mental illnesses like stress, anxiety, and depression could be well expressed in people of all ages starting from adolescence to retirement age. Although we found no such significant association with age for stress and depression-affected individuals except for anxiety. Onset of anxiety disorders can also be influenced by psychological and social risk factors. Geriatric anxiety and depression share several risk factors, including

female gender, cognitive impairment, chronic health issues, poor self-rated health, functional restrictions, and personality features like neuroticism and inadequate coping mechanisms.^{69,70} In the case of other social-demographic factors like alcohol intake, smoking habits, and medication intake, we also don't find an association with common mental conditions. Some previous studies could prove that the effect of the above-mentioned elements has a profound effect on stress, anxiety, and depression. Perhaps in the present case, the participants are hiding or not willing to

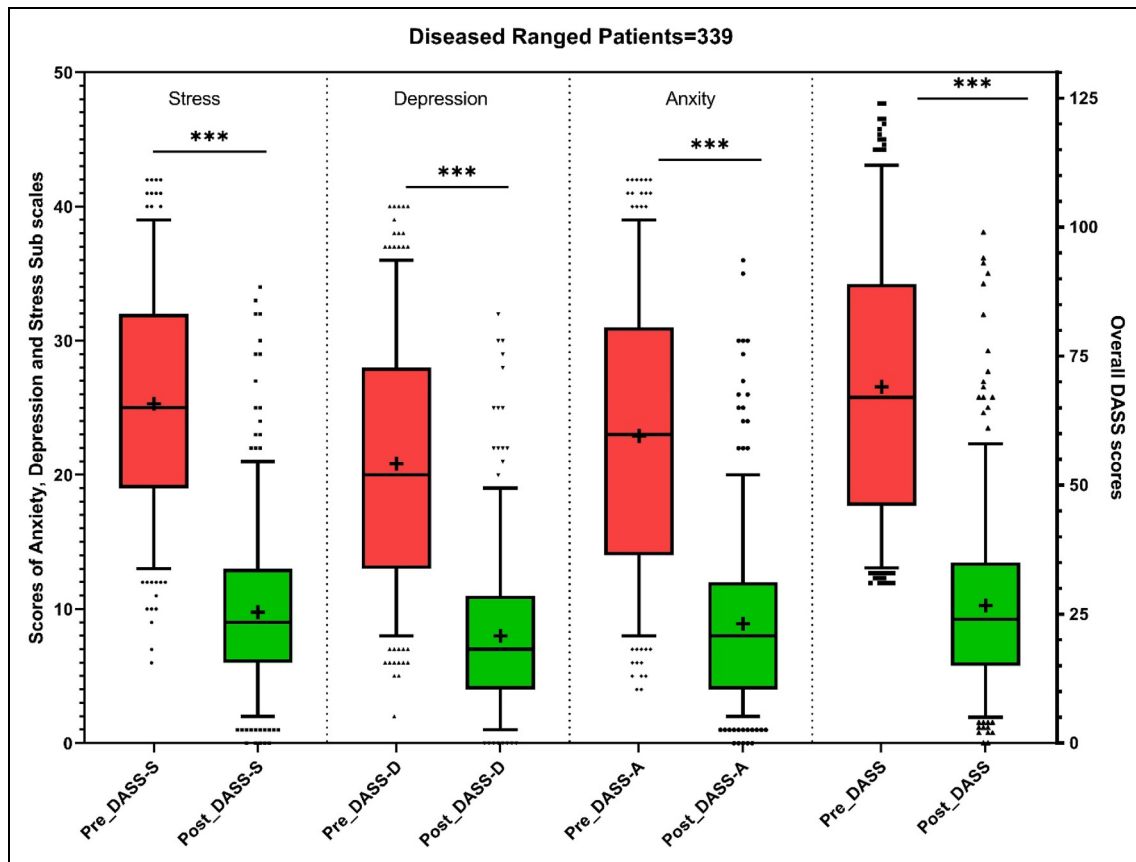


Figure 4. Effect of Yagna Pathy on Mental conditions of patients under the diseased category.

share their ill habits. Thus, the proportion of affirmative and negative cases varied significantly. One of the most promising and expected outcomes of the study was to showcase the importance of physical activity in mental well-being. We could observe a significant association between any type of physical activity that exists with stress, depression, and anxiety. In the world of modern medicine, the benefits of regular physical activity on health are without dispute. The mechanisms behind exercise's antidepressant benefits are still unknown, even though research consistently links exercise with depression. Thermogenic theory,⁷¹ endorphin hypothesis,⁷² monoamine hypothesis,⁷³ distraction hypothesis,⁷⁴ self-efficacy enhancement,⁷⁵ and other plausible physiological and psychological causes have all been discussed. Most of these theories, however, have little research backing them up.

Another interesting finding of the present study is the significant strong correlation ($R^2 > 0.7$; $p < 0.05$) among the subscales of DAS (DASS-A, DASS-S, and DASS-D). In both cases of pre and post-performance of Yagna therapy, the observation remains the same. This implies two conclusions, first, if someone develops any one attribute of CMD, the other two or one element of CMD that is stress or anxiety or depression, could also develop. Secondly, after the performance of *Yagna Pathy*, all three attributes are reduced correlatively. Thus, this can be inferred that *Yagna Pathy* could be fruitful for

controlling CMD holistically. There was no such association with these mental disorders in previous literature till now. Thus, the present study could provide a noble avenue for further medical research.

The main goal of our study was to determine whether *Yagna Pathy* could have a controlling effect on CMD and if yes then to what extent? As cited in previous literature, Yagna is considered a powerful and comprehensive ancient therapy. Any type of sickness, whether somatic, mental, somatopsychic, or psychosomatic, can be improved by this therapy. Yagna is more of a religious practice but is also considered an herbal smoke therapy recommended for mental peace. Along the same lines, in this present study we could validate that the Yagna herbal smoke therapy has significantly reduced anxiety, depression, and stress (Table 2). There are three aspects of performance of Yagna which could affirmatively affect mental wellness. First, the ingredients used in the Yagna therapy led to the release of herbal smoke. Studies could prove that the ingredients are diversified and effective while they are released as herbal smoke during performing Yagna. While performing *Yagna* the ingredients are used to pour into the fire and mantras are chanted. The pouring is called Agni Hotra. "Agni" means 'fire' and "Hotra" means an 'offering'; Agnihotra means the act of an oblation into the fire.⁷⁶ Agnihotra consists of a base fire generated in a specifically designed vessel fixed on the surface of the level ground. Burning fire of some

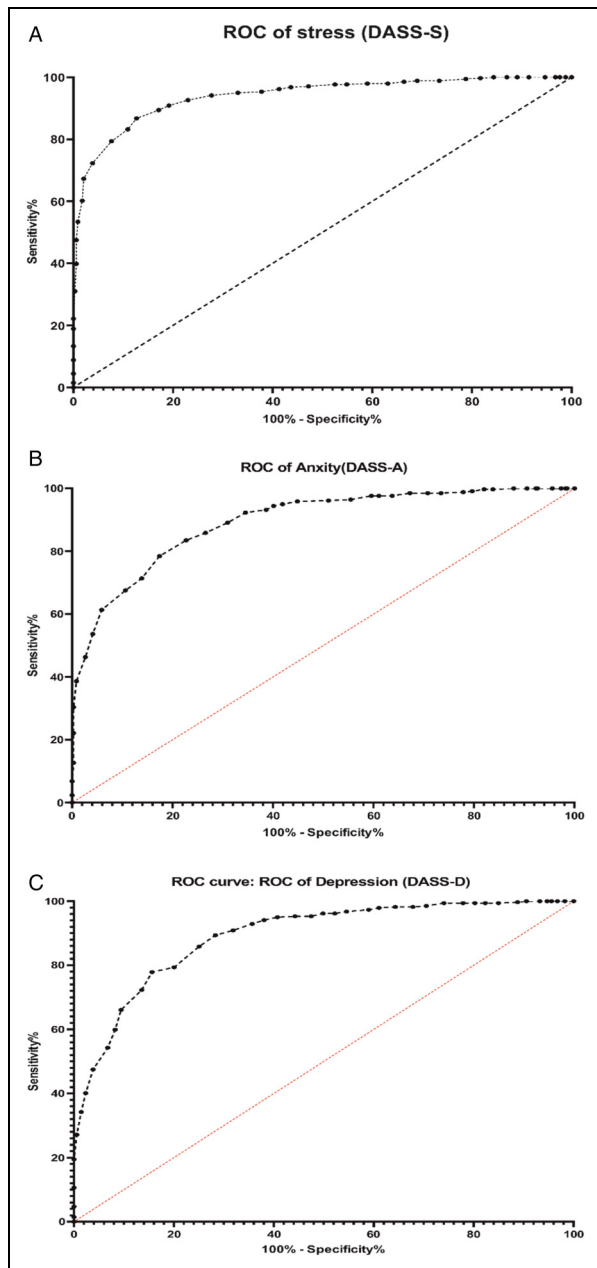


Figure 5. Receiver operating characteristics (ROC) of the stress (A), anxiety (B) and depression (C).

specified characteristics forms the base fire. To this base fire specific substances like clarified butter (ghee) and herbal materials are added in the form of oblations. The detailed literature has been reviewed by Chaube and the coworkers.⁴⁸ The study also provided the information of active compounds released during the Yagna which eventually have significant effect on different parts of nervous system. Apart from that, the herbal smoke was proved to be air cleanser and could act as antifungal, anti-bacterial agent. The chanting of mantras is acted as noise therapy.⁴⁸ During the hawan, *dev yagya* & *balivaishv dev yagya*, and other mantras are chanted. The frequencies of mantras coupled with herbal

smoke bring a resonance effect on the brain neurons and possibly that may bring peace of mind.⁷⁷⁻⁷⁹ Previous studies also support the same but the number of participants who participated in the studies was not significant to justify.⁵⁴⁻⁵⁶ The present study involves a significant sample size as per power analysis. Thus, it holds significant justification for the effectiveness of *Yagna Pathy* to control CMD.

It is crucial to maintain inclusivity and respect for different belief systems while discussing the ethical issues surrounding the use of *Yagna Pathy* as a therapeutic intervention, especially in a country with a diverse population in terms of culture and religion like India. *Yagna Pathy* is based on Hindu spiritual practices, hence those from non-Hindu backgrounds could find it difficult to participate if it goes against their own spiritual or religious views. Our study followed ethical guidelines that prioritize informed consent and cultural sensitivity in order to manage these challenges. Before participating, participants received thorough information about the spiritual and cultural aspects of *Yagna Pathy*, enabling them to make an informed choice based on their personal tastes and beliefs. Furthermore, *Yagna Pathy*'s applicability must be expanded beyond Hindu communities in India and around the world, which calls for careful cultural adaptation and respect for various religious viewpoints. By adopting cultural competence concepts and customizing procedures to conform to local customs, comparable indigenous healing techniques have been successfully incorporated into mental health care systems around the world.⁸⁰ Subsequent investigations ought to go into methods for modifying *Yagna Pathy* to encompass a wide range of religious and spiritual traditions, thereby expanding its applicability and approval as a mild psychological remedy.

In conclusion, researchers can promote an atmosphere of respect and inclusivity by proactively addressing these ethical dimensions. This will guarantee that *Yagna Pathy* and other indigenous healing techniques positively impact mental health care without unintentionally marginalizing or excluding people based on their spiritual or religious affiliations.

Limitation of the Study

The study's reliance on quantitative data analysis may have limited the investigation of complex reactions and unique experiences because it did not use qualitative techniques, such as focus groups or in-depth interviews, to record participants' subjective experiences and feedback.

The participant population was homogeneous, consisting exclusively of individuals who identified as Hindu, which may restrict the generalizability of findings to populations with diverse religious and cultural backgrounds.

Biochemical or brain imaging results that could provide a more precise correlation with the DASS questionnaire outcomes were not obtained, limiting the ability to establish exact physiological correlates of the observed mental health outcomes.

The study did not investigate the dose-dependent effects of *Yagna Pathy* on prevalent mental diseases, which could have

provided insights into the therapeutic efficacy of these interventions across varying levels of treatment intensity.

Due to the cross-sectional design of the study, causal relationships between variables could not be inferred, highlighting a limitation in establishing temporal or cause-effect relationships among the observed variables.

Conclusion

In conclusion, *Yagna Pathy*, rooted in ancient literature, transcends religious, caste, and creed boundaries, making it accessible to all. The findings highlight the practical implications of *Yagna Pathy*, emphasizing its potential as a cost-effective, non-invasive and low-intensity psychological interventions for managing mental wellness. The study contributes to a deeper understanding of alternative mental health treatments and underscores the importance of integrating traditional practices into contemporary healthcare approaches. Moving forward, further research could explore broader applications and long-term benefits of *Yagna Pathy*.

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Authorship Contribution Statement

Acharya Balkrishna: Conceptualization, Funding acquisition, Sourav Ghosh: Writing – original draft and Reviewing, Data curation, Formal analysis, Anuradha Gupta: Methodology, Data curation, Vedpriya Arya: Writing - review & editing, Project management.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical Approval

The ethical committee has approved the study as a part of project no. **PAC/IEC/2022/11/37** entitled “*Attitude towards integrated pathy as a questionnaire-based observational study for the assessment of patients visiting Patanjali wellness, Haridwar for their improvement and chemical-acceptance towards integrated pathy*” Here we are reporting a retrospective study of medical records, and all data were fully anonymized before accessed them.

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References

1. GBD 2019 Mental Disorders Collaborators. Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet Psychiatry*. 2022;9(2):137-150. [https://doi.org/10.1016/S2215-0366\(21\)00395-3](https://doi.org/10.1016/S2215-0366(21)00395-3)
2. Tan W, Chen L, Zhang Y, et al. Regional years of life lost, years lived with disability, and disability-adjusted life-years for severe mental disorders in Guangdong Province, China: a real-world longitudinal study. *Glob Health Res Policy*. 2022;7(1):1-14. <https://doi.org/10.1186/S41256-022-00253-3/FIGURES/2>
3. Goldberg D. A bio-social model for common mental disorders. *Acta Psychiatr Scand Suppl*. 1994;90(s385):66-70. <https://doi.org/10.1111/J.1600-0447.1994.TB05916.X>
4. Kovacevic R. *Mental health: lessons learned in 2020 for 2021 and forward*, 2021. <https://blogs.worldbank.org/health/mental-health-lessons-learned-2020-2021-and-forward>
5. Gupta A, Ghosh S, Om R, Arya V, Balkrishna A. Effects of a yoga protocol in managing depression, anxiety and stress among office workers during the COVID-19 pandemic: a cross-sectional study. *Sri Lanka J Psychiatry*. 2023;14(1):32-35. <https://doi.org/10.4038/SLJPSYC.V14I1.8390>
6. Ettman CK, Abdalla SM, Cohen GH, Sampson L, Vivier PM, Galea S. Prevalence of depression symptoms in US adults before and during the COVID-19 pandemic. *JAMA Netw Open*. 2020;3(9):e2019686. <https://doi.org/10.1001/jamanetworkopen.2020.19686>
7. Wang QQ, Kaelber DC, Xu R, Volkow ND. COVID-19 risk and outcomes in patients with substance use disorders: Analyses from electronic health records in the United States. *Mol Psychiatry*. 2021;26(1):30-39. <https://doi.org/10.1038/S41380-020-00880-7>
8. WHO. *COVID-19 pandemic triggers 25% increase in prevalence of anxiety and depression worldwide*, 2022a. <https://www.who.int/news/item/02-03-2022-covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide>
9. WHO. *Mental health and COVID-19*, 2022b. WHO. <https://www.who.int/teams/mental-health-and-substance-use/mental-health-and-covid-19>
10. Yashadhana A, Derbas A, Biles J, Grant J. Pandemic-related racial discrimination and its health impact among non-Indigenous racially minoritized peoples in high-income contexts: a systematic review. *Health Promot Int*. 2022;37(2):daab144. <https://doi.org/10.1093/HEAPRO/DAAB144>
11. Aneja R, Ahuja V. An assessment of socioeconomic impact of COVID-19 pandemic in India. *J Public Aff*. 2021;21(2):e2266. <https://doi.org/10.1002/PA.2266>
12. Rasul G, Nepal AK, Hussain A, et al. Socio-Economic implications of COVID-19 pandemic in south Asia: Emerging risks and growing challenges. *Front Sociol*. 2021;6:629-693. <https://doi.org/10.3389/fsoc.2021.629693>
13. UNDP. *Socio-economic impact of COVID-19*. United Nations Development Programme, 2022. <https://www.undp.org/coronavirus/socio-economic-impact-covid-19>

14. Our World in Data. *COVID-19 Data Explorer*, September 29, 2022. <https://ourworldindata.org/explorers/coronavirus-data-explorer>
15. Afrin S, Nasrullah SM, Dalal K, et al. Mental health status of adolescents in-home quarantine: a multi-region, cross-sectional study during COVID-19 pandemic in Bangladesh. *BMC Psychol.* 2022;10(1):1-12. <https://doi.org/10.1186/S40359-022-00819-3/TABLES/5>
16. Jassim G, Jameel M, Brennan E, Yusuf M, Hasan N, Alwatani Y. Psychological impact of COVID-19, isolation, and quarantine: a cross-sectional study. *Neuropsychiatr Dis Treat.* 2021;17:1413-1421. <https://doi.org/10.2147/NDT.S311018>
17. Radwan E, Radwan A, Radwan W, Pandey D. Prevalence of depression, anxiety and stress during the COVID-19 pandemic: a cross-sectional study among Palestinian students (10–18 years). *BMC Psychol.* 2021;9(1):1-12. <https://doi.org/10.1186/S40359-021-00688-2/TABLES/9>
18. Reagu S, Wadoo O, Latoo J, et al. Psychological impact of the COVID-19 pandemic within institutional quarantine and isolation centres and its sociodemographic correlates in Qatar: a cross-sectional study. *BMJ Open.* 2021;11(1):e045794. <https://doi.org/10.1136/BMJOPEN-2020-045794>
19. Morales-Montoya M, Córdova-Limaylla N, Briceño-Vergel G, et al. Psychological impact on dental students and professionals in a Lima population during COVID-19s wave: a study with predictive models. *Sci Rep.* 2022;12(1):1-12. <https://doi.org/10.1038/s41598-022-18899-x>
20. Ramiz L, Contrand B, Rojas Castro MY, et al. A longitudinal study of mental health before and during COVID-19 lockdown in the French population. *Global Health.* 2021;17(1):1-16. <https://doi.org/10.1186/S12992-021-00682-8/TABLES/4>
21. Reuter PR, Forster BL, Kruger BJ. A longitudinal study of the impact of COVID-19 restrictions on students' health behavior, mental health and emotional well-being. *PeerJ.* 2021;9:e12528. <https://doi.org/10.7717/PEERJ.12528/SUPP-3>
22. Hamaideh SH, Al-Modallal H, Tanash M, Hamdan-Mansour3 A. Depression, anxiety and stress among undergraduate students during COVID-19 outbreak and "home-quarantine". *Nurs Open.* 2022;9(2):1423-1431. <https://doi.org/10.1002/NOP2.918>
23. Li X, Yu H, Yang W, et al. Depression and anxiety among quarantined people, community workers, medical staff, and general population in the early stage of COVID-19 epidemic. *Front Psychol.* 2021;12:638985. <https://doi.org/10.3389/fpsyg.2021.638985>
24. Shah SMA, Mohammad D, Qureshi MFH, Abbas MZ, Aleem S. Prevalence, psychological responses and associated correlates of depression, anxiety and stress in a global population, during the coronavirus disease (COVID-19) pandemic. *Community Ment Health J.* 2021;57(1):101-110. <https://doi.org/10.1007/S10597-020-00728-Y>
25. Abbott A. COVID's mental-health toll: How scientists are tracking a surge in depression. *Nature.* 2021;590(7845):194-195. <https://doi.org/10.1038/D41586-021-00175-Z>
26. Rodríguez-Hidalgo AJ, Pantaleón Y, Dios I, Falla D. Fear of COVID-19, stress, and anxiety in university undergraduate students: a predictive model for depression. *Front Psychol.* 2020;11:591797. <https://doi.org/10.3389/fpsyg.2020.591797>
27. Longest K, Kang JA. Social media, social support, and mental health of young adults during COVID-19. *Front Commun.* 2022;7:23. <https://doi.org/10.3389/FCOMM.2022.828135/BIBTEX>
28. Su Z, McDonnell D, Wen J, et al. Mental health consequences of COVID-19 media coverage: The need for effective crisis communication practices. *Global Health.* 2021;17(1):1-8. <https://doi.org/10.1186/S12992-020-00654-4/FIGURES/1>
29. Wheaton MG, Prikhidko A, Messner GR. Is fear of COVID-19 contagious? The effects of emotion contagion and social media use on anxiety in response to the coronavirus pandemic. *Front Psychol.* 2021;11:567379. <https://doi.org/10.3389/FPSYG.2020.567379/FULL>
30. Goel I, Sharma S, Kashiramka S. Effects of the COVID-19 pandemic in India: an analysis of policy and technological interventions. *Health Policy Technol.* 2021;10(1):151-164. <https://doi.org/10.1016/J.HLPT.2020.12.001>
31. Sardar T, Nadim SS, Rana S, Chattopadhyay J. Assessment of lockdown effect in some states and overall India: a predictive mathematical study on COVID-19 outbreak. *Chaos, Solitons Fractals.* 2020;139:110078. <https://doi.org/10.1016/J.CHAOS.2020.110078>
32. Shukla M, Pandey R, Singh T, et al. The effect of COVID-19 and related lockdown phases on young peoples' worries and emotions: Novel data from India. *Front Public Health.* 2021;9:594. <https://doi.org/10.3389/FPUBH.2021.645183/BIBTEX>
33. Soni P. Effects of COVID-19 lockdown phases in India: an atmospheric perspective. *Environ Dev Sustain.* 2021;23(8):12044-12055. <https://doi.org/10.1007/S10668-020-01156-4>
34. Bouare N, Minta DK, Dabo A, Gerard C. COVID-19: a pluralistic and integrated approach for efficient management of the pandemic. *World J Virol.* 2022;11(1):20-39. <https://doi.org/10.5501/WJV.V11.I1.20>
35. Gerotziakas GT, Catalano M, Theodorou Y, et al. The COVID-19 pandemic and the need for an integrated and equitable approach: an international expert consensus paper. *Thromb Haemostasis.* 2021;121(8):992. <https://doi.org/10.1055/A-1535-8807>
36. Lam CS, Koon HK, Chung VCH, Cheung YT. A public survey of traditional, complementary and integrative medicine use during the COVID-19 outbreak in Hong Kong. *PLOS ONE.* 2021;16(7):e0253890. <https://doi.org/10.1371/JOURNAL.PONE.0253890>
37. Moradian N, Ochs HD, Sedikies C, et al. The urgent need for integrated science to fight COVID-19 pandemic and beyond. *J Transl Med.* 2020;18(1):1-7. <https://doi.org/10.1186/S12967-020-02364-2/METRICS>
38. Tillu G, Chaturvedi S, Chopra A, Patwardhan B. Public health approach of ayurveda and yoga for COVID-19 prophylaxis. *J Altern Complement Med.* 2020;26(5):360-364. <https://doi.org/10.1089/ACM.2020.0129>
39. Verma S, Mishra A, Shrivastava V. Yagya therapy in vedic and ayurvedic literature: a preliminary exploration. *Interdiscip J Yagya Res.* 2018;1(1):15-20. <https://doi.org/10.36018/IJYR.V1I1.7>
40. Riley KE, Park CL. How does yoga reduce stress? A systematic review of mechanisms of change and guide to future inquiry. *Health Psychol Rev.* 2015;9(3):379-396. <https://doi.org/10.1080/17437199.2014.981778>

41. Ross A, Friedmann E, Bevans M, Thomas S. National survey of yoga practitioners: Mental and physical health benefits. *Complement Ther Med*. 2013;21(4):313-323. <https://doi.org/10.1016/J.CTIM.2013.04.001>
42. Panwar D, Singh RR, Kulshetra N. Importance of Yagya in treating COVID-19 conditions -A classical review. *World J Pharm Life Sci*. 2021;7(6):51-57. https://www.wjpls.org/home/article_abstract/2257.
43. Bahadur S, Pardhi DM, Rautio J, Rosenholm JM, Pathak K. Intranasal nanoemulsions for direct nose-to-brain delivery of actives for CNS disorders. *Pharmaceutics*. 2020;12(12):1230. <https://doi.org/10.3390/PHARMACEUTICS12121230>
44. Giunchedi P, Gavini E, Bonferoni MC. Nose-to-Brain delivery. *Pharmaceutics*. 2020;12(2):593-601. <https://doi.org/10.3390/PHARMACEUTICS12020138>
45. Jeong SH, Jang JH, Lee YB. Drug delivery to the brain via the nasal route of administration: Exploration of key targets and major consideration factors. *J Pharm Investig*. 2022;53:119-1152. <https://doi.org/10.1007/S40005-022-00589-5>
46. Trevino JT, Quispe RC, Khan F, Novak V. Non-Invasive strategies for nose-to-brain drug delivery. *J Clin Trials*. 2020;10(7):439.
47. Bansal P, Kaur R, Gupta V, Kumar S, Kaur R. Is there any scientific basis of hawan to be used in epilepsy-prevention/cure? *J Epilepsy Res*. 2015;5(2):33-45. <https://doi.org/10.14581/JER.15009>
48. Chaube RK, Chaube VK, Saxena P, Solanki K, Chandra Tiwari RV, Tiwari H. Scientific rationale of Yagya: a review. *Int J Community Med Public Health*. 2020;7(7):2831. <https://doi.org/10.18203/2394-6040.IJCMPH20203022>
49. Rastogi V, Krishnanand S, Panwar RB, et al. Quality analysis, anti-bacterial activity and chemical characterization of ethnobotanical (Hawan) medicinal fumes. *Interdiscip J Yagya Res*. 2022;5(1):1-19. <https://doi.org/10.36018/IJYR.V5I1.79>
50. Bhavana KR Shreevathsa. Medical geography in Charaka Samhita. *Ayu*. 2014;35(4):371. <https://doi.org/10.4103/0974-8520.158984>
51. Romana RK, Sharma A, Gupta V, Kaur R, Kumar S, Bansal P. Was Hawan designed to fight anxiety-scientific evidences? *J Relig Health*. 2020;59(1):505-521. <https://doi.org/10.1007/S10943-016-0345-1>
52. Kumar D. Air pollution mitigation through yajna: Vedic and modern views. *Environ Conservat J*. 2019;20(3):57-60. <https://doi.org/10.36953/ECJ.2019.20308>
53. Shukla SD, Bhatnagar M, Khurana S. Critical evaluation of ayurvedic plants for stimulating intrinsic antioxidant response. *Front Neurosci*. 2012;6(JULY):1-12. <https://doi.org/10.3389/FNINS.2012.00112>
54. Hedge M. Comparative study of influence of Yajña and Yogāsana on stress level as measured by electron photonic imaging (EPI) technique. *Int J Sci Res*. 2014;3(8):1402-1406. https://www.researchgate.net/publication/344688982_Comparative_study_of_Influence_of_Yajna_and_Yogasana_on_stress_level_as_Measured_by_Electron_Photonic_Imaging_EPI_Technique
55. Kumar M, Shrivastava P. The effect of GSR biofeedback relaxation on anxiety and stress in patients with type II diabetes mellitus: a randomized controlled trial. *J Rehabilitat Sci Res*. 2022;9(1):16-22. <https://doi.org/10.30476/JRSR.2021.92520.1211>
56. Nilachal N, Trivedi P. A case study of the effect of Yagya on the level of stress and anxiety. *Interdiscip J Yagya Res*. 2019;2(2):7-10. <https://doi.org/10.36018/IJYR.V2I2.44>
57. STROBE. *STROBE - Strengthening the reporting of observational studies in epidemiology*, 2022. <https://www.strobe-statement.org/>
58. Clark LA, Watson D. Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *J Abnorm Psychol*. 1991;100(3):316-336. <https://doi.org/10.1037//0021-843X.100.3.316>
59. Lovibond S, Lovibond PFC. *Lovibond: Depression anxiety and stress scales (DASS) - Google Scholar*, 2013. https://scholar.google.com/scholar_lookup?title=Manual+for+the+Depression+Anxiety+Stress+Scales&author=SH+Lovibond&author=PF+Lovibond&publication_year=1995&
60. Cowles B, Medvedev ON. Depression, anxiety and stress scales (DASS). In: Medvedev ON, Krägeloh CU, Siegert RJ, Singh N eds. *Handbook of Assessment in Mindfulness Research*. Springer; 2022:1-15. https://doi.org/10.1007/978-3-030-77644-2_64-1. ISBN: 978-3-030-77644-2
61. Park SH, Song YJC, Demetriou EA, et al. Validation of the 21-item Depression, Anxiety, and Stress Scales (DASS-21) in individuals with autism spectrum disorder. *Psychiatry Res*. 2020;291:113300. <https://doi.org/10.1016/J.PSYCHRES.2020.113300>
62. Sharma S. *Super Science of Gayatri: (All World Gayatri Pariwar)*. 2nd ed. Bhagwati Adhyatmik Seva Kendra; 2010. http://literature.awgp.org/book/Super_Science_of_Gayatri/v1.
63. Ghosh S, Mukherjee I, Thakur AR, Ray Chaudhuri S. Assay for rapid screening of phytochemicals as antimicrobial agents. *Am J Biochem Biotechnol*. 2013;9(1):8-11. <https://doi.org/10.3844/AJBBS.2013.8.11>
64. Park SH, Goo JM, Jo CH. Receiver operating characteristic (ROC) curve: Practical review for radiologists. *Korean J Radiol*. 2004;5(1):11-18. <https://doi.org/10.3348/kjr.2004.5.1.11>
65. Carter JV, Pan J, Rai SN, Galandiuk S. ROC-ing along: Evaluation and interpretation of receiver operating characteristic curves. *Surgery (United States)*. 2016;159(6):1638-1645. <https://doi.org/10.1016/j.surg.2015.12.029>
66. Hanley JA, McNeil BJ. A method of comparing the areas under receiver operating characteristic curves derived from the same cases. *Radiology*. 1983;148(3):839-843. <https://doi.org/10.1148/RADIOLOGY.148.3.6878708>
67. Ryu SJ, Lee SJ, Park CH, et al. Arterial pressure, end-tidal carbon dioxide, and central venous oxygen saturation in reflecting compression depth. *Acta Anaesthesiol Scand*. 2016;60(7):1012-1023. <https://doi.org/10.1111/aas.12728>
68. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ*. 2011;2:53-55. <https://doi.org/10.5116/IJME.4DFB.8DFD>
69. Lenze EJ, Wetherell JL. A lifespan view of anxiety disorders. *Dialogues Clin Neurosci*. 2011;13(4):381-399. <https://doi.org/10.31887/DCNS.2011.13.4/ELENZE>
70. Schulz R, Drayer RA, Rollman BL. Depression as a risk factor for non-suicide mortality in the elderly. *Biol Psychiatry*. 2002;52(3):205-225. [https://doi.org/10.1016/S0006-3223\(02\)01423-3](https://doi.org/10.1016/S0006-3223(02)01423-3)
71. Craft LL, Perna FM. The benefits of exercise for the clinically depressed. *Prim Care Companion CNS Disord*. 2004;6(3):104. <https://doi.org/10.4088/PCC.V06N0301>

72. Deboer LB, Powers MB, Utschig AC, Otto MW, Smits JAJ. Exploring exercise as an avenue for the treatment of anxiety disorders. *Expert Rev Neurother.* 2012;12(8):1011-1022. <https://doi.org/10.1586/ERN.12.73>
73. Heninger GR, Delgado PL, Charney DS. The revised monoamine theory of depression: a modulatory role for monoamines, based on new findings from monoamine depletion experiments in humans. *Pharmacopsychiatry.* 1996;29(1):2-11. <https://doi.org/10.1055/s-2007-979535>
74. Privitera GJ, Antonelli DE, Szal AL. An enjoyable distraction during exercise augments the positive effects of exercise on mood. *J Sports Sci Med.* 2014;13(2):266-270. <https://doi.org/10.1177/0264031413489429>
75. Meng Y, Deng B, Liang X, et al. Effectiveness of self-efficacy-enhancing interventions on rehabilitation following total hip replacement: a randomized controlled trial with six-month follow-up. *J Orthop Surg Res.* 2022;17(1):1-11. <https://doi.org/10.1186/S13018-022-03116-2/TABLES/3>
76. Limaye V. Agnihotra Homa and its effect on plants possible role of phytohormone brassinolide. *Quest J J Res Agric Anim Sci.* 2020;7(1):2321-9459. www.questjournals.org
77. Acharya S. *Eternity of sound and the science of mantras (Sabda Brahm: Mantra Vijnana) | Exotic India Art*, 2012. <https://www.exoticindiaart.com/book/details/eternity-of-sound-and-science-of-mantras-sabda-brahm-mantra-vijnana-nad917/>
78. Balkrishna A, Katiyar P, Ghosh S, Singh SK, Arya V. Impact assessment of integrated-pathy on cancer-related fatigue in cancer patients: an observational study. *J Health Populat Nutr.* 2024;43(1):1-10. <https://doi.org/10.1186/S41043-024-00537-Z/FIGURES/5>
79. Farrar AJ, Farrar FC. Clinical aromatherapy. *Nursing Clinics of North America.* 2020;55(4):489-504. <https://doi.org/10.1016/J.CNUR.2020.06.015>
80. Hartmann WE, Gone JP. Incorporating traditional healing into an urban American Indian Health Organization: a case study of community member perspectives. *J Couns Psychol.* 2012;59(4):542-554. <https://doi.org/10.1037/A0029067>