

# Impact of Scientific Pranayama on Sleep Apnea, Glycemic Regulation, Hypertension, Respiratory Stability, and Sleep Quality: A Prospective Observational Study

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**Abstract** *This is an observational study that evaluated the impact of Scarce offerings of daily Scientific Pranayama among six people with 21days to 3 months of observations. There were notable improvements in which AHI decreased by 40 percent, HbA1c reduced, blood pressure was better controlled, chronic cough disappeared, musculoskeletal pain decreased, and the quality of sleep improved. Although the sample size is small, the results are promising to indicate that Scientific Pranayama can help manage the autonomic balance and lifestyle disorder.*

**Key Words:** *Scientific Pranayama, Autonomic Regulation, Sleep Apnea, HbA1c, Hypertension, Lifestyle Disorders, Observational Study, Respiratory Health.*

## 1. INTRODUCTION

The fast emerging lifestyle diseases is a significant health threat in the world. Chronic stress, decreased physical activity, and disproportion of the autonomic nervous system are closely linked to such conditions as Sleeping disorders [obstructive sleep apnea (OSA)], hypertension, obesity, diabetes, chronic pain, stress disorders depression, anxiety and sleep disturbances.

Prolonged sympathetic activity is involved in the increased cortisol release, dysfunction of the endothelium, insulin resistance, inflammatory presentation and sleep disorders [1]. Although pharmacological management remains crucial, non-pharmacological treatments that aim at regulating the autonomic system are becoming accepted as complementary therapies.

Scientific Pranayama: This is a system of breathing which has its basis in the yogic science, yet it is practiced in a systematic fashion, with regularity and discipline [ratio and time]. Controlled breathing has been reported to increase the parasympathetic and vagal tone, increase the variability of heart rate, decrease the levels of stress hormones and increase the efficiency of oxygen use [1], [3]. Moreover, interventions that involve breathing are seen to be advantageous in terms of stress reduction and emotional control [2].

This paper compares the multi system effects of Scientific Pranayama based on objective physiology and self-reported outcomes.

## 2. METHODOLOGY

### 2.1 Study Design

Prospective observational and interventional study

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## 2.2 Participants

Six individuals aged 43–59 years with lifestyle-related conditions including:

- Obstructive Sleep Apnea
  - Prediabetes
  - Hypertension
  - Chronic cough
  - Musculoskeletal pain
  - Sleep fragmentation and cognitive fatigue
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- All participant identities were anonymized.

## 2.3 Intervention

Participants practiced Scientific Pranayama daily for 21 days to 3 months (20–30 minutes per session).

Structured techniques included:

- Bhastrika (force inhalation and force exhalation)
- Kapalabhati (focuses on rapid exhalation)
- Nadi Shodhana/Anulom Vilom (alternate nostril breathing)
- Bhramari (humming exhalation)
- Pranav (Observe the breathing)

## 2.4 Outcome Measures

Parameter	Assessment Tool
AHI	CPAP AirView Reports
HbA1c	Laboratory testing
Blood Pressure	Digital sphygmomanometer
Pain & Mobility	Functional self-assessment
Sleep Quality	Sleep Quality
Cough	Symptom resolution tracking

## 2.5 Ethical Considerations

Data were used with participant consent. No medication modifications were advised by the investigators.

## 3. RESULTS

### 3.1 Sleep Apnea Case

The AHI was **0.5 events/hour** (Jan–Mar 2024). After three months of Scientific Pranayama practice, AHI reduced to **0.3 events/hour** (Apr–Jun 2024).

This shows a **40% reduction**, improved airway stability and autonomic regulation, a shift from sympathetic to Parasympathetic dominance.

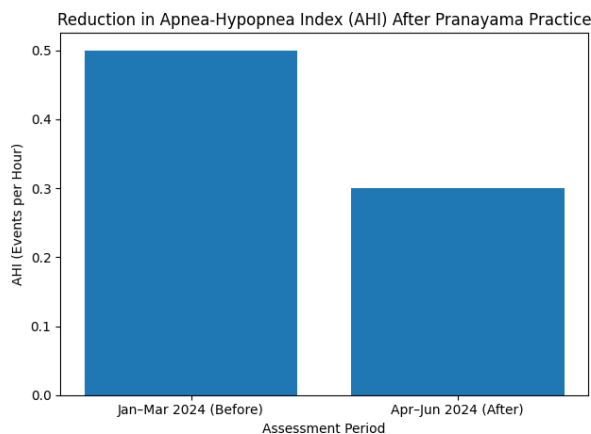


Fig-1: Reduction in Apnea-Hypopnea Index (AHI) Following Scientific Pranayama Practice

### 3.2 Glycemic Regulation Case

- HbA1c levels reduced from **6.2% to 5.7%** within three months without medication modification.

It boosts metabolism, improves cognitive function and reduces stress with conditions like type 2 diabetes.

### 3.3 Hypertension Case

Observed improvements included:

3.3.1 Snoring intensity is reduced

3.3.2 Improved daytime alertness

3.3.3 Blood pressure levels are reduced (continuing prescribed medication)

These changes suggest reduced sympathetic over-activation and improved vagal tone.

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### 3.4 Musculoskeletal Pain Case

Participants stated:

- Less knee discomfort
- A reduction in joint rigidity
- Increased mobility without assistance
- Less frequent migraines

These results point to enhanced circulation and possible inflammatory process reduction.

### 3.5 Chronic Cough and Sleep Confidence Case

A participant exhibiting a chronic cough for approximately two months preceding the intervention reported:

- Cough reduces and stopped within five days of practices Pranayama
- No return
- Sleep quality improves.

This suggests that, it improved respiratory endurance and strengthens immune response and autonomic calming effects have improved.

### 3.6 Sleep Fragmentation and Cognitive Fatigue Case

A participant exhibiting chronic sleep fragmentation and day time fatigue reported:

- Times waking up at night reduced
- Better sleep continuity
- More energy during the day
- Improvement in mental clarity and decision making.

These changes show that the parasympathetic system is working better resulting in reduction in cortisol levels. It has been shown to reduce GAD and depression by increasing neuroplasticity and modulating the amygdala's response to stress.

Case	Primary Condition	Duration	Observed Outcome
1	Obstructive Sleep Apnea	3 months	AHI ↓ 40%
2	Prediabetes	3 months	HbA1c ↓
3	Hypertension	3 months	BP & snoring ↓

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4	Musculoskeletal Pain	21 days	Mobility improved
5	Chronic Cough	5 days	Symptom resolved
6	Sleep Fragmentation	1 month	Sleep & cognition improved

#### 4. DISCUSSION

The fact that the Regular practice of Pranayama, not only balances the Tri dosha. The three biological energies – Vata (gaseous), Pitta Fluid/fiery and, Kapha (mucus). There are consistent improvements in all our system in the body.ie., Digestive, Respiratory, circulatory and nervous system. Neurocognitive functions indicate systemic autonomic modulation by organized breath regulation.

Slow and controlled rhythmic breathing patterns has been found to increase parasympathetic activity -increase in happy Hormone-Dopamine, over the autonomic nervous system and decrease sympathetic activity –decrease in cortisol hormone [1]. This could be the reason for improvements seen in sleep stability, respiratory control, and stress tolerance.

Decreased psychological stress and increased emotional stability seen in the subjects correlate with previous studies showing the positive effects of yogic breathing practices on neurophysiological stress mechanisms and anxiety regulation [2].

The decrease in psychological stress and increased emotional stability seen in the subjects also correlate with previous studies showing the positive effects of yogic breathing practices on neurophysiological stress mechanisms and anxiety regulation [2].

The improvement in blood pressure regulation seen in the hypertension case study is consistent with previous studies showing that pranayama increases baroreceptor sensitivity and improves cardiovascular function [5]. Breathing exercises have also been shown to improve autonomic function and heart rate variability [3]. The decrease in HbA1c levels seen in the prediabetes case study may be attributed to the improvement in metabolic regulation due to stress hormone modulation. Previous studies

#### 4 LIMITATIONS

- Small sample size (n=6)
- No control group
- Partial reliance on participant-reported outcomes
- Short follow-up duration

Larger randomized controlled studies are required to establish causality and statistical significance.

#### 5 CONCLUSION

Scientific Pranayama showed positive changes in the severity of sleep apnea, glycemic control, blood pressure management, stability of respiration, musculoskeletal pain, and sleep quality in this

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observational study. Scientific Pranayama, being a systematic, non-invasive, and inexpensive technique, can be a useful addition to the management of lifestyle disorders. The results are in line with studies that have been shown the benefits of Scientific Pranayama breathing techniques on the autonomic and metabolic parameters [1], [4].

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