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# Immediate Effects of Anulom Vilom And Brahmari Pranayama on Autonomic and Psychological Parameters in Cancer Patients: A Comparative Pilot Study

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***Abstract -*** *Cancer incidence are continously increasing despite the advanced medical treatments . Though the survival rates are increasing, persistent stress leads to autonomic imbalance and reduced quality of life in cancer patients. The Research papers regarding the immediate effects of specific pranayama is limited.This pilot study is aimed to compare the immediate effects of Brahmari and Anulom Vilom Pranayama on heart rate variability and stress parameters in cancer patients. A comparative pre and post study was conducted among 14 participants recruited in Mirakle Integrated Health Center,Pollachi. They were allocated into two groups equally, Anulom Vilom (n=7) and Brahmari (n=7). Participants practiced 12 Rounds of respective pranayama. Heart rate variability parameters and stress indices were assessed at baseline and immediately after intervention. The Anulom Vilom group showed improved autonomic modulation,HRV and reduced stress and the Brahmari group showed reduced stress indices but the LF HF ratio is increased suggesting sympathetic dominance. Both the pranayama is helpful in reducing stress, but Anulom Vilom is more powerful in combating stress and improving heart rate variability. Larger randomized studies are needed to validate these findings.*

**Key Words: Cancer, Heart Rate Variability, Pranayama, Stress, Autonomic Regulation, Integrative Oncology**

## 1. INTRODUCTION

Cancer is one of the major global health burden causing physical and psychological stress despite many advanced medical treatments[1]. Beyond the pathology of disease, diagnosis and treatment often precipitates the stress characterized by overactivity of sympathetic nervous system and withdrawal of parasympathetic nervous system[2].

Persistent overactivity of sympathetic nervous system leads and hypothalamo pituitary axis leads to autonomic imbalance mainly in cancer patients[3]. This is characterized by reduced Heart Rate Variability and increased stress indices associated with Systemic inflammation and decreased survival in cancer patients.

Integrative oncology mainly aims to mitigate these side effects by holistic approach. Pranayama,the yogic breathing technique does not treat cancer directly but significantly improves the autonomic variables and reduces stress. HRV is the dynamic interplay between sympathetic and parasympathetic nervous system. Higher HRV indicates greater vagal tone and adaptive resilience, whereas lower HRV suggests sympathetic dominance and stress vulnerability[4].

## 1.2. METHODOLOGY

### 1.2.1 Study Design and Setting

A two arm Comparative pre and post study was conducted at Mirakle Integrated Health Center,Pollachi. A total of 14 patients diagnosed with various types of cancer are taken for study. Participants were made to sit in a relaxed, upright posture and were given a two-minute stabilization window before baseline data was collected and they were allocated into two groups:

- Group A (Anulom Vilom, n=7): Participants performed alternate nostril breathing without retention (kumbhaka). The ratio of inhalation to exhalation was maintained at a comfortable pace (approximately :1 or 1:2) for 12 rounds
- Group B (Brahmari, n=7): Participants performed the "Humming Bee Breath," inhaling deeply and exhaling slowly while making a low-pitched humming sound, with eyes closed and ears blocked for 12 rounds.

Each participant performed only one specific pranayama technique to prevent cross-interference of autonomic adaptations.

### 1.2.2 Outcome Measures

Autonomic function was measured using a non-invasive Heart Rate Variability (HRV) device Zephyr bioharness. Data was recorded for 3 minutes at baseline (Pre) and 3 minutes immediately after the intervention.

Key parameters included:

- SNS Index: A composite marker of Sympathetic tone.
- Stress Index (SI): A geometric measure of HRV indicating physiological load.
- SDNN: Standard deviation of NN intervals (marker of overall variability).
- LF/HF Ratio: Ratio of Low Frequency to High Frequency power.

### 1.2.3 Statistical Analysis

Descriptive statistics are presented as Median and Interquartile Range (IQR). The Wilcoxon Signed Rank Test assessed within-group changes, and the Mann-Whitney U Test compared differences between groups. Significance was set at $p < 0.05$.

## 2. RESULTS

Group A (Anulom Vilom): Significant improvements were observed across all parameters. The SNS Index decreased significantly ($Z = -2.366$, $p = .018$), and the Stress Index reduced from a median of 32.83 to 23.65 ($Z = -2.366$, $p = .018$). SDNN, reflecting overall autonomic flexibility, improved significantly ($p = .018$).

Group B (Brahmari): There were no statistically significant changes in any autonomic parameters immediately following the intervention. Trends were mixed, with some participants showing increased stress scores (Table 1).

**Table 1: Comparison of Pre and Post Autonomic Parameters (Median ± IQR)**

| Parameter | Group | Time | Median | IQR (25th–75th) | p-value* |
|---|---|---|---|---|---|
| SNS Index | Anulom Vilom | Pre<br>Post | 5.57<br>4.10 | 3.29 – 7.14<br>2.80 – 4.54 | .018 |

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|---|---|---|---|---|---|
| | Bhramari | Pre<br>Post | 4.05<br>4.39 | 3.43 – 5.58<br>2.71 – 4.68 | .735 |
| Stress Index | Anulom Vilom | Pre<br>Post | 32.83<br>23.65 | 22.80 – 40.86<br>18.79 – 24.43 | .018 |
| | Bhramari | Pre<br>Post | 25.11<br>28.53 | 22.91 – 35.12<br>16.21 – 34.91 | .398 |
| SDNN (ms) | Anulom Vilom | Pre<br>Post | 9.93<br>15.19 | 7.12 – 19.77<br>11.45 – 21.22 | .018 |
| | Bhramari | Pre<br>Post | 11.59<br>11.32 | 9.23 – 13.03<br>9.23 – 22.94 | .499 |

*IQR – Interquartile Range | SNS- Sympathetic Nervous System | SDNN-Standard Deviation of NN intervals*

The magnitude of change (Post minus Pre) was compared between groups. The Anulom Vilom group showed a significantly greater reduction in the Stress Index (Mean Rank = 4.00) compared to the Bhramari group (Mean Rank = 11.00; U=0.00, p=.002). Similarly, the reduction in SNS tone was significantly greater in the Anulom Vilom group (p=.029).

**Table 2: Between-Group Comparison of Change Scores**

| Variable (Change Score) | Mann-Whitney U | Z-Score | p-value | Favors |
|---|---|---|---|---|
| SNS Index Reduction | 6.000 | -2.181 | .029 | Anulom Vilom |
| Stress Index Reduction | 0.000 | -3.130 | .002 | Anulom Vilom |
| SDNN Improvement | 4.000 | -2.492 | .013 | Anulom Vilom |

This study showed that Anulom Vilom pranayama significantly improves autonomic balance in cancer patients. Anulom Vilom and Parasympathetic Activation: The Anulom Vilom group exhibited a uniform and significant reduction in sympathetic tone and physiological stress. The slow, rhythmic nature of Anulom Vilom may stimulate the baroreceptors, enhancing the cardio vagal baroreflex sensitivity. The statistically significant increase in the LF/HF ratio (p=.028) in this group, drop in SNS Index, increase in LF power driven by the slow respiratory rate (resonance frequency breathing) rather than sympathetic activation.

Brahmari and Variability: Contrary to the hypothesis, Brahmari Pranayama did not elicit significant immediate autonomic changes in this sample. Brahmari is often cited for its calming effect due to the vagal stimulation from laryngeal vibration, our data suggests that 12 rounds may be insufficient to produce a consistent physiological shift in cancer patients who have high baseline stress. The physical effort of sound production might initially prevent full relaxation in new practitioners diagnosed with cancer.

Limitations: The primary limitations are the small sample size (N=14) and the lack of a non-intervention control group. Future studies should explore the effects of longer durations (>15 minutes) of Brahmari with larger people.

## 3. CONCLUSION

The findings underscore that both pranayama hold the capacity to decrease stress indicators in cancer patients, but their immediate effects on the autonomic nervous system are distinct. The data suggests that Anulom Vilom is a superior immediate intervention for autonomic balancing in this specific population. Larger, well-designed randomized controlled studies are needed to validate and confirm its effectiveness and generalizability.

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