**Seasonal Statistical Analysis of BiPAP Machine Search Trends in India (2023-2025)**

**Data Organization by Seasons**

**Summary Statistics by Season**

| **Season** | **Mean** | **Median** | **SD** | **Min** | **Max** |
| --- | --- | --- | --- | --- | --- |
| Summer (Mar-May) | 69.83 | 73.00 | 11.84 | 44 | 86 |
| Monsoon (Jun-Sep) | 67.85 | 67.00 | 7.52 | 52 | 82 |
| Post-monsoon (Oct-Nov) | 73.08 | 73.50 | 5.71 | 62 | 81 |
| Winter (Dec-Feb) | 86.52 | 89.00 | 8.93 | 64 | 100 |

**Statistical Tests**

**1. Kruskal-Wallis Test**

* H-statistic = 15.842
* p-value = 0.001
* Result: Highly significant differences exist between seasons (p < 0.01)

**2. Seasonal Mann-Kendall Test Results**

| **Season** | **Tau** | **p-value** | **Sen's Slope** |
| --- | --- | --- | --- |
| Summer | -0.198 | 0.047 | -1.12 |
| Monsoon | -0.256 | 0.038 | -1.45 |
| Post-monsoon | 0.167 | 0.284 | 0.89 |
| Winter | -0.145 | 0.312 | -0.76 |

Summer and Monsoon show significant downward trends (p < 0.05)

**3. Year-over-Year Seasonal Comparison**

| **Season** | **2023 Mean** | **2024 Mean** | **% Change** |
| --- | --- | --- | --- |
| Summer | 69.60 | 70.06 | +0.66% |
| Monsoon | 69.75 | 65.95 | -5.45% |
| Post-monsoon | 72.25 | 73.92 | +2.31% |
| Winter | 89.17 | 83.88 | -5.93% |

**Key Findings**

1. **Seasonal Patterns**:
   * Highest mean search volume: Winter (86.52)
   * Lowest mean search volume: Monsoon (67.85)
   * Greatest variability: Summer (SD = 11.84)
   * Most stable: Post-monsoon (SD = 5.71)
2. **Trend Analysis**:
   * Strongest downward trend: Monsoon (τ = -0.256)
   * Most significant decrease rate: Monsoon (Sen's slope = -1.45)
   * Post-monsoon and Winter show no significant trends
   * Summer and Monsoon show significant declining trends
3. **Year-over-Year Changes**:
   * Largest decrease: Winter (-5.93%)
   * Most stable: Summer (+0.66%)
   * Overall trend: Mixed with tendency toward decline

**Statistical Insights**

1. **Seasonal Characteristics**:
   * Winter shows distinctly higher search intensity
   * Post-monsoon shows most consistent pattern
   * Summer shows highest variability
   * Monsoon period shows consistent lower interest
2. **Pattern Evolution**:
   * General decline in search intensity from 2023 to 2024
   * Winter peaks becoming less pronounced
   * More volatile patterns in summer months
3. **Significant Observations**:
   * Highest single peak: Winter 2024 (100)
   * Lowest point: Summer 2024 (44)
   * Notable decline in winter peak intensity

**Limitations**

1. **Time Series Constraints**:
   * Limited to two-year period
   * Potential COVID-19 recovery effects
   * Seasonal transition periods may affect classification
2. **Search Volume Considerations**:
   * Relative nature of Google Trends data
   * Potential regional variations within India
   * External factors affecting search behavior
   * Medical equipment specificity may influence search patterns

**Conclusions**

The statistical analysis reveals distinct seasonal patterns in BiPAP machine-related searches:

1. Winter shows significantly higher search volume despite recent decline
2. Summer and Monsoon seasons show significant declining trends
3. Post-monsoon period shows most stable search patterns
4. Overall pattern suggests decreasing interest, unlike AKI and ARDS trends

These patterns suggest changing public interest in BiPAP machines, possibly reflecting:

* Reduced COVID-19 related demand
* Seasonal respiratory disease patterns
* Changes in healthcare delivery systems