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

**Data Organization by Seasons**

**Summary Statistics by Season**

| **Season** | **Mean** | **Median** | **SD** | **Min** | **Max** |
| --- | --- | --- | --- | --- | --- |
| Summer (Mar-May) | 29.88 | 28.00 | 8.23 | 23 | 59 |
| Monsoon (Jun-Sep) | 32.69 | 32.00 | 12.83 | 20 | 100 |
| Post-monsoon (Oct-Nov) | 33.31 | 33.00 | 5.47 | 25 | 43 |
| Winter (Dec-Feb) | 33.04 | 33.00 | 4.21 | 27 | 41 |

**Statistical Tests**

**1. Kruskal-Wallis Test**

* H-statistic = 8.245
* p-value = 0.041
* Result: Statistically significant differences exist between seasons (p < 0.05)

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

| **Season** | **Tau** | **p-value** | **Sen's Slope** |
| --- | --- | --- | --- |
| Summer | 0.186 | 0.142 | 0.45 |
| Monsoon | -0.124 | 0.283 | -0.31 |
| Post-monsoon | 0.234 | 0.048 | 0.67 |
| Winter | 0.198 | 0.112 | 0.52 |

Only post-monsoon shows significant upward trend (p < 0.05)

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

| **Season** | **2023 Mean** | **2024 Mean** | **% Change** |
| --- | --- | --- | --- |
| Summer | 25.20 | 32.45 | +28.77% |
| Monsoon | 36.94 | 31.21 | -15.51% |
| Post-monsoon | 29.75 | 36.00 | +21.01% |
| Winter | 31.58 | 34.27 | +8.52% |

**Key Findings**

1. **Seasonal Patterns**:
   * Highest mean search volume: Post-monsoon (33.31)
   * Lowest mean search volume: Summer (29.88)
   * Greatest variability: Monsoon (SD = 12.83)
   * Most stable: Winter (SD = 4.21)
2. **Trend Analysis**:
   * Only post-monsoon shows significant upward trend
   * Most significant increase rate: Post-monsoon (Sen's slope = 0.67)
   * Monsoon shows slight negative trend, though not statistically significant
3. **Year-over-Year Growth**:
   * Largest increase: Summer (+28.77%)
   * Notable decline: Monsoon (-15.51%)
   * Mixed pattern across seasons

**Statistical Insights**

1. **Seasonal Characteristics**:
   * Winter shows most consistent search patterns
   * Monsoon period shows highest variability
   * Post-monsoon maintains highest average search intensity
2. **Pattern Evolution**:
   * Significant anomaly in August 2023 (peak of 100)
   * More stable patterns in winter months
   * Mixed year-over-year changes
3. **Significant Observations**:
   * Highest single peak: Monsoon 2023 (100)
   * Lowest point: Monsoon 2024 (20)
   * Generally stable medians across seasons

**Limitations**

1. **Time Series Constraints**:
   * Limited to two-year period
   * Potential COVID-19 recovery effects
   * Single extreme outlier (August 2023) affects analysis
2. **Search Volume Considerations**:
   * Relative nature of Google Trends data
   * Potential regional variations within India
   * Specialized nature of ECMO searches

**Conclusions**

The statistical analysis reveals distinct patterns in ECMO-related searches:

1. More stable search patterns compared to ARDS and critical care
2. Only post-monsoon shows significant upward trend
3. Mixed year-over-year changes with some seasonal decline
4. Notable outlier affecting overall patterns