

Analysing Maternal Mental Health: A Statistical Study on Postpartum Depression Symptoms and Age Factors

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ABSTRACT:

Postpartum depression (PPD) is a mood disorder affecting women after childbirth, marked by sadness, anxiety, and fatigue, and impacting both mother and child. This study analyzes a dataset on PPD symptoms across maternal age groups, finding consistent symptom prevalence including sadness, anxiety, sleep disturbances, and cognitive issues. Visualizations like pie and bar charts highlight symptoms, patterns and demographic trends. The results emphasize PPD's multifactorial nature and the need for universal screening regardless of age. Data-driven methods are crucial for early detection and improving maternal mental health outcomes.

Keywords:

Postpartum depression, Depression, Suicide, Sleep disturbances, Anxiety

1.INTRODUCTION

Postpartum depression (PPD) is a significant psychiatric disorder that affects many new mothers in the months following childbirth, presenting a multidimensional challenge for health professionals due to the complex interplay of hormonal shifts, emotional responses, societal expectations, and medical history. Early detection is crucial, as PPD can severely impact maternal well-being and early childhood development, leading to symptoms such as sadness, irritability, trouble sleeping, feelings of guilt, and, in severe cases, suicidal ideation. This article presents an exploratory data analysis of postpartum depression risk factors, leveraging an extensive symptom-anchored dataset of postpartum women from a South Asian cohort to identify patterns, prevalence, and interrelated symptoms. Through data visualization and descriptive statistics, the study highlights the distribution of common PPD-related symptoms across different age groups of mothers, aiming to guide healthcare professionals in identifying at-risk populations and providing timely interventions and support to reduce adverse outcomes for both mother and child.

2. MATERIALS AND METHODS

2.1 DATA SET DESCRIPTION:

The dataset comprises over 1,490 responses collected through a structured questionnaire administered to postpartum women, with each record documenting a timestamp, age bracket, and self-reported symptoms related to mood, behavioral changes, and emotional well-being during the postpartum period. Key attributes include feelings of sadness or tearfulness, irritability towards the baby and partner, trouble sleeping at night, concentration difficulties, changes in appetite, anxiety, feelings of guilt, bonding issues with the baby, and instances of suicide attempts. Age is categorized into brackets (e.g., 25-30, 30-35, etc.), while symptoms are recorded with categorical responses such as "Yes," "No," "Sometimes," or through frequency indicators. The dataset highlights key variables, including demographics (age of respondents), symptoms (sadness, irritability, sleep problems, focus issues, eating disorders, anxiety, guilt, bonding issues, and suicide attempts), and timestamps indicating the time of survey completion.

2.2 DATA PREPARATION:

In the data preparation phase, missing values were addressed by removing incomplete responses, long question texts were renamed to shorter labels for clarity (e.g., "Feeling sad or tearful" was shortened to "Sad Tearful"), and age distributions were analyzed for each symptom to facilitate a more streamlined analysis.

3. METHODOLOGY FOR POSTPARTUM DEPRESSION DATA ANALYSIS

Step 1: Data Importing and Initial Setup

The analysis began by importing the dataset post natal data.csv using the pandas library, which served as the primary tool for handling tabular data. Supporting libraries such as NumPy and SciPy were included for statistical operations, while matplotlib and Seaborn were used for data visualization. I Python widgets were also added to enable interactive exploration of results.

Step 2: Data Preview and Inspection

The dataset's structure was reviewed and revealed with 11 columns that include basic details such as age and timestamp, along with multiple variables related to emotional and behavioral symptoms.

Step 3: Handling Missing Values and Data Cleaning

Missing values were checked across all columns, revealing only minimal gaps. In the categorical symptom variables, ambiguous responses such as "Sometimes," "Maybe," and "Not interested to say" were identified for consideration during preprocessing and modelling.

Step 4: Exploratory Data Analysis (EDA)

Exploratory Data Analysis (EDA) was performed to examine the frequency and distribution of postpartum depression symptoms across different age groups. Key symptoms like anxiety, sadness, and sleep problems were identified as prevalent indicators. This analysis provides crucial insights to inform predictive modeling and targeted interventions. Some of the analysis based on symptoms, Age, Relationships were examined here. It includes

- Symptom Frequency Analysis:

- Count of each symptom's "Yes" responses is calculated.
- Symptoms like "Feeling anxious," "Feeling sad or tearful," and "Suicide attempt" are quantified to understand prevalence.
- Age-wise Distribution:
 - Frequency of symptoms analyzed across different maternal age groups (25-30, 30-35, etc.).
 - This reveals symptom patterns by age, showing no single age group dominates in symptom prevalence.
- Cross-Feature Relationships:
 - Investigates how symptoms co-occur (e.g., sadness with anxiety, guilt with bonding issues).
 - This helps identify common symptom clusters and potential composite markers for PPD risk.

Step 5: Feature Engineering and Data Transformation (Potential)

The dataset worked for this article includes mixed categorical responses requiring encoding techniques such as one-hot and label encoding for effective analysis. Ambiguous categories were addressed through imputation and grouping to maintain data quality. The timestamp feature allows for temporal analysis to track symptom progression in postpartum depression.

Step 6: Data Visualization

The dataset was visualized using various plot types such as histograms, scatter plots, and count plots implemented through libraries like Seaborn and Matplotlib. These visualizations effectively illustrate the distribution of postpartum depression symptoms across different age groups, highlighting how symptom prevalence varies by demographic segments. Correlation matrices were also employed to reveal interrelationships among symptoms and risk factors, enabling the identification of key symptom clusters. Additionally, interactive widgets powered by Ipywidgets facilitated dynamic filtering and exploration of data subsets, enhancing the depth of analysis by allowing real-time data interrogation.

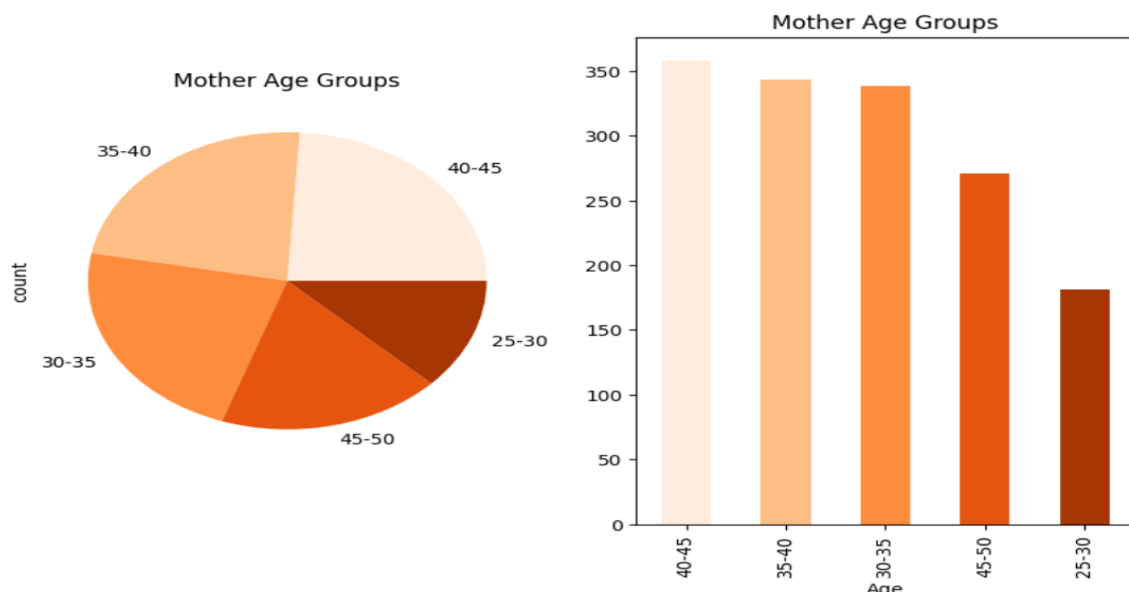


Figure 3.1 The distribution of mothers across different age groups in the dataset.

- The pie chart on the left visualizes the proportion of respondents in each age bracket (25-30, 30-35, 35-40, 40-45, and 45-50), indicating how many mothers belong to each age category.
- The bar chart on the right represents the absolute count of respondents within each age group, showing that the largest number of mothers are in the 40-45 age group, followed by 35-40 and 30-35, while the smallest group is 25-30.

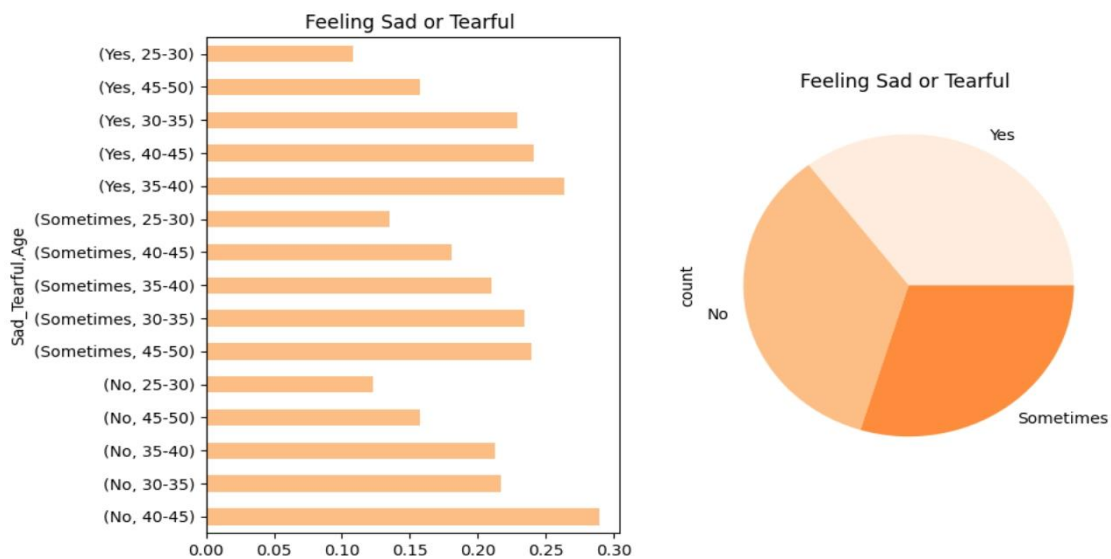


Figure 3.2 The distribution of responses to the question "Feeling Sad or Tearful" among postpartum women, segmented by age group.

- The horizontal bar chart on the left shows the proportion of mothers in different age groups who reported "Yes," "Sometimes," or "No" feelings of sadness or tearfulness. It highlights how these emotional states vary slightly across ages from 25-30 to 45-50.
- The pie chart on the right illustrates the overall proportion of respondents who answered "Yes," "No," or "Sometimes" regardless of age, showing that the majority experience sadness or tearfulness at least sometimes in the postpartum period.

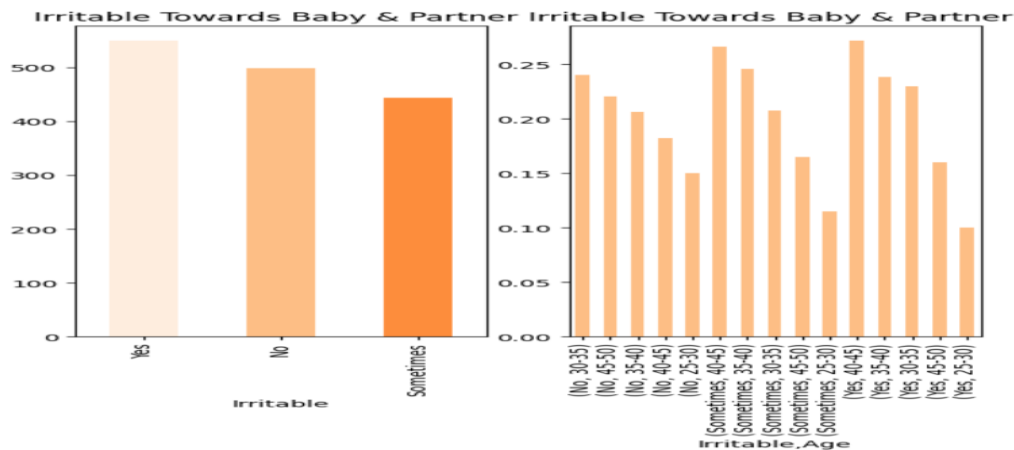


Figure 3.3 Irritability towards baby and partner

The figure shows the distribution of irritability towards baby and partner among postpartum women, where the majority reported being irritable (“Yes”), followed by “No” and “Sometimes.” When broken down by age groups, irritability was found to be more common among women aged 30–40, while those in the 25–30 age group showed the least irritability.

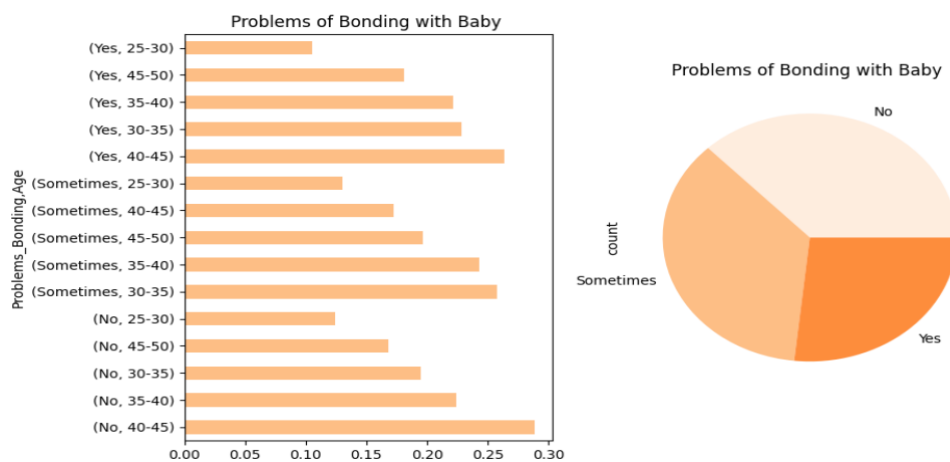


Figure 3.4 problems of bonding with the baby

The figure portrays the distribution of problems of bonding with the baby among postpartum women. The pie chart shows that the majority reported “Sometimes” experiencing bonding issues, followed by “No” and then “Yes.” The bar chart further breaks this down by age group, indicating that bonding problems (both “Yes” and “Sometimes”) are more common in women aged 30–45 years, while younger women in the 25–30 age group reported fewer bonding issues.

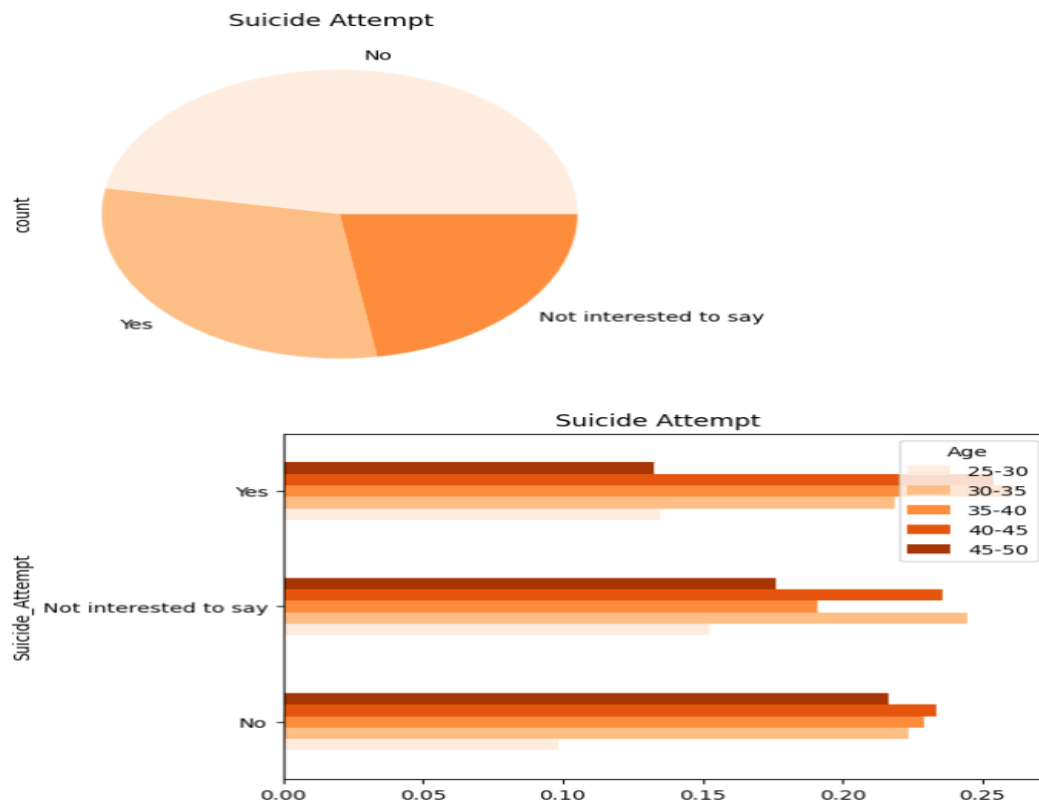


Figure 3.5 The distribution of suicide attempts among postpartum women

The figure illustrates the distribution of suicide attempts among postpartum women. The pie chart shows that the largest proportion of respondents reported “No” suicide attempt, followed by those who answered “Yes” and a significant portion who were “Not interested to say.” The bar chart breaks this down by age groups (25–30, 30–35, 35–40, 40–45, 45–50), revealing that suicide attempts (“Yes”) are reported more often among women aged 30–40 years, while the “Not interested to say” responses are also relatively high in the same age range. The “No” category is fairly strong across all ages, particularly among women aged 40–45. Overall, the visualization highlights that while a majority of women denied suicide attempts, a considerable proportion admitted to them, and many chose not to disclose, indicating both the sensitivity and seriousness of this issue in the context of postpartum depression

4.RESULT AND CONCLUSION

The analysis of the postpartum depression dataset revealed a significant prevalence of symptoms among surveyed mothers, including high rates of anxiety, sadness or tearfulness, trouble sleeping, and cognitive difficulties such as problems concentrating. These symptoms were consistently observed across all maternal age groups, indicating that the risk of postpartum depression spans broadly regardless of age. Interactive visualizations and correlation analyses identified common symptom clusters, particularly linking feelings of sadness with anxiety and guilt, alongside bonding problems, underscoring the multifactorial nature of postpartum depression. This study highlights the critical importance of systematic data analysis and visualization to uncover symptom patterns and prevalence, emphasizing the need for widespread and continuous maternal mental health monitoring across all age groups. Early and comprehensive screening informed by such data-driven approaches can improve detection accuracy, facilitate timely intervention, and ultimately enhance health outcomes for mothers and their families.

5.FUTURE SCOPE

The future scope of this work includes extending the analysis by integrating longitudinal data to track symptom progression over time, enabling more precise prediction of postpartum depression onset and severity. Advanced machine learning techniques, including deep learning and natural language processing of patient narratives, may enhance early detection and personalized intervention strategies. Furthermore, developing real-time monitoring tools could provide continuous support and timely alerts for at-risk mothers, fostering proactive mental health care and better clinical outcomes.

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