ST. TERESA'S COLLEGE (AUTONOMOUS),ERNAKULAM

AFFILIATED TO MAHATMA GANDHI UNIVERSITY,KOTTAYAM

PROJECT REPORT ON

THE IMPACT OF MATERNAL STRESS ON CHILD BEHAVIOR

In partial fulfilment of the requirements for the award of the degree of

BACHELOR OF SCIENCE IN COMPUTER APPLICATIONS [TRIPLE MAIN]

Submitted By

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III B.Sc. Computer Applications [Triple Main]

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Under the guidance of

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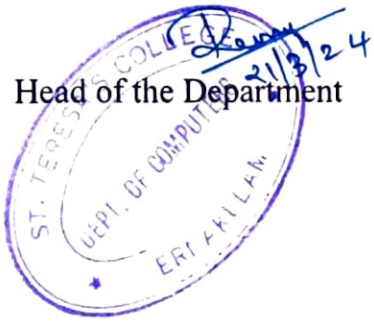
2021 – 2024

CERTIFICATE

This is to certify that the project report entitled **"The Impact of Maternal Stress on Child Behavior"** is a bona fide record of the work done by ADHEENA SABU (SB21CA002) during the year 2021 – 2024 and submitted in partial fulfilment of the requirements for the degree of Bachelor of Science in Computer Applications (Triple Main) under Mahatma Gandhi University, Kottayam.

Submitted for end semester exam held on ..... 22/03/2024 .....

Head of the Department



for 21/3/24
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DECLARATION

I, ADHEENA SABU (Register no: SB21CA002), B.Sc. Computer Applications [Triple Main] final year student of St. Teresa's College (Autonomous), Ernakulam, hereby declare that the project submitted named "Impact of Maternal Stress on Child behavior" for the Bachelor's Degree in Computer Applications [Triple Main] is my original work. I further declare that the said work has not previously been submitted to any other university or academic body.

Date: 21.03.2024

Place: ERNAKULAM

ADHEENA SABU

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I would like to express my profound gratitude to the **Head of the Department of Computer Applications Ms. Remya C J**, my project guide Assistant professor **Ms. Harsha KM**, and all other faculty of the department for their contributions to the completion of my project. The completion of the project would not have been possible without their help and insights.

Finally, I take this opportunity to Thank all them who has directly or indirectly helped me with my project.

ADHEENA SABU

SYNOPSIS

Maternal stress during pregnancy and its impact on child behavior is a critical area of research that has garnered increasing attention in recent years. This project aims to investigate the relationship between maternal stress levels during pregnancy and after pregnancy with both child and grown child behavior. Through a comprehensive methodology involving questionnaire design, data collection, cleaning, and analysis, the project explores correlations and predictions of variations in child behavior based on maternal stress levels.

The results reveal significant findings regarding the association between maternal stress and adverse outcomes, such as major life events during pregnancy. Moreover, the project uncovers correlations between maternal stress and both child and grown child behavior, with regression analysis providing further insights into the predictive power of maternal stress on behavior outcomes.

Specific behavioral patterns exhibited by children of highly stressed mothers are identified, with hyperactivity or impulsivity emerging as a key finding. The project underscores the significance of addressing maternal stress during pregnancy and highlights the need for interventions to mitigate its adverse effects on child behavior.

Contents

1.INTRODUCTION

1.1 ABOUT PROJECT

This project investigates the impact of maternal stress during and after pregnancy on child behavior. Through questionnaire-based data collection and statistical analysis, correlations and predictive relationships between maternal stress levels and child behavior are explored. Findings highlight the significant influence of maternal stress on both child and grown child behavior, with implications for intervention and support strategies.

1.2 ABOUT ORGANIZATION

The Congregation of the Carmelite Sisters of St. Teresa founded St. Teresa's College, a pioneering institution in the field of higher education in India, on June 15, 1925. It was the first women's college in the former Cochin State and the second in all of Kerala. To prepare young women for the challenges in the IT industry, the Department of Computer Applications was founded in 1995 and provides a variety of computer application courses. Via seminars, lectures, project work, assignments, and ICT enabled teaching, we advocate for a student-centered teaching method. Also, periodically hold lectures on new hardware and software technologies and career orientation.

1.3 Objectives of the Project

The main objective of this project is to understand the impact of maternal stress on child behavior. Specifically, the project aims to

Investigate the correlation between maternal stress levels during pregnancy and after pregnancy and child behavior.

Determine how maternal stress levels predict variations in child behavior.

Identify specific behavioral patterns exhibited by children of highly stressed mothers.

Assess the relationship between reported maternal stress levels and major life events or changes during pregnancy.

By achieving these objectives, the project seeks to contribute to a better understanding of the complex interplay between maternal stress and child development

2.LITERATURE REVIEW

Impact of maternal stress on outcome of newborn(2020)

This study investigated the association between maternal stress during pregnancy and newborn outcomes. Researchers included 200 pregnant women in their third trimester. They used the Perceived Stress Scale (PSS) to assess stress levels and found that over half of the women experienced stress. Higher stress levels were linked to lower birth weight and preterm deliveries. The study suggests that maternal stress can negatively impact newborn health and highlights the need for interventions to manage stress during pregnancy.

Maternal depression and childhood aggression(2012)

This article reviewed existing literature on the connection between maternal depression and childhood aggression. The researchers conducted a search using keywords in various databases and reviewed 13 relevant articles. The review found that maternal depression can contribute to childhood aggression through negative parenting behaviors. However, the authors call for additional research due to the quality of the articles and the complexity of the topic.

Effects of maternal stress on child's social development

This study explored the relationship between maternal parenting stress and child social development. Mothers and their children were recruited for the study, and measures were used to assess parenting stress and child social development. Data analysis revealed variations in parenting attitudes and significant differences based on individual mother variables. The findings emphasize the importance of programs to reduce stress and support positive social development in children.

Maternal anxiety and attention problems in children (2010)

This study examined the association between maternal anxiety from pregnancy to 5 years and child attention problems at 5 and 14 years. A birth cohort of 3,982 individuals was involved in the study. Self-reported measures of maternal anxiety were assessed at four time points, and maternal reports of child attention problems were measured at 5 and 14 years. The study found a link between maternal anxiety and child attention problems, suggesting a need for treatment programs that target both mothers and children.

Effect of prenatal maternal stress on child learning and memory(2006)

This study explored the impact of prenatal maternal stress on the learning and memory of children. The researchers measured stress levels during pregnancy in 117 children and assessed learning and memory during pregnancy. Maternal stress was measured at three points, and cortisol samples were collected when the children were one year old. The study found that higher stress levels during pregnancy were associated with slight decreases in attention/concentration scores in school-aged offspring, suggesting a potential link between maternal stress and cognitive development.

Maternal mental health, pregnancy outcomes, and child behavior(2011)

This review analyzed literature on maternal mental health, focusing on pregnancy, birth outcomes, and child behavior. The review highlights the global prevalence of antenatal and postnatal psychological distress. The authors call for comprehensive research to explore the challenges of examining different effects and the persistence of antenatal distress. They also note a gap in research on paternal mental health and child behavioral outcomes.

3.METHODOLOGY

The method consisted of preparing questionnaire, collecting data, selecting an appropriate method, data cleaning, analyzing our obtained data and visualizing it.

3.1 Data Collection

Designing Questionnaire: The first step involved designing a structured questionnaire to collect relevant data. The questionnaire was carefully crafted to address key aspects such as maternal stress levels, child behavior assessments, major life events during pregnancy, family support, parenting style, and current behavior assessment.

Distributing the Questionnaire: The questionnaire was then distributed among the target population, which typically consisted of mothers with children of various ages. Distribution method include online survey

Collecting Responses: Responses from the participants were collected systematically to ensure data integrity.

Data Cleaning and Analysis: Upon collecting a sufficient number of responses, the data underwent thorough cleaning and preprocessing. This step involved identifying and rectifying any inconsistencies, missing values, or outliers in the dataset to ensure its reliability and validity.Once the data was cleaned, various statistical analyses were performed to derive meaningful insights and conclusions. Common analysis techniques included descriptive statistics, correlation analysis, chi-square tests, and regression analysis.

3.2 Methods Used

Descriptive Statistics: Provided summary statistics for the variables of interest, including maternal stress levels during pregnancy, stress levels after pregnancy, child behavior assessments, and current child behavior. Descriptive statistics included counts, means, standard deviations, minimum and maximum values, as well as quartiles (25th, 50th, and 75th percentiles).

Chi-square Test for Association: Conducted a chi-square test to explore the relationship between reported maternal stress levels during pregnancy and the occurrence of major life events or changes during that period. Calculated the chi-square test statistic and corresponding p-value to assess the significance of the association. Interpreted the results, considering the significance level (typically set at 0.05), and made conclusions about the relationship between maternal stress and major life events during pregnancy.

Correlation Analysis: Performed correlation analysis to examine the relationship between maternal stress levels during pregnancy and child behavior assessments, as well as current child behavior. Calculated Pearson correlation coefficients to quantify the strength and direction of the linear relationship between these variables. Evaluated the significance of the correlations using p-values, with a significance level typically set at 0.05. Interpreted the correlation coefficients to understand the degree of association between maternal stress and child behavior.

Regression Analysis: Conducted regression analysis to predict variations in child behavior based on maternal stress levels during pregnancy. Fitted regression models to estimate the relationship between maternal stress during pregnancy and both child behavior assessments and current child behavior. Reported regression coefficients, including intercepts and slopes, to understand how maternal stress levels predict variations in child behavior. Interpreted the regression coefficients to determine the magnitude and direction of the relationship between maternal stress and child behavior.

3.3 Data Visualization

Visualizations were crafted using Python to distill complex data patterns into easily understandable insights. We depicted descriptive statistics, correlations, and regression results with clarity and precision.

4.RESULTS

4.1 Discriptive statistics

Source code:

```
import pandas as pd

# Load your dataset
data = pd.read_csv('/content/sample_data/comments1.csv')

# Select columns of interest
columns_of_interest = ['stress_during_pregnancy', 'stress_a_pregnancy', 'child_behav', 'current_c_b']

# Compute descriptive statistics
statistics = data[columns_of_interest].describe()

# Print descriptive statistics
print(statistics)
```

Output

```
       stress_during_pregnancy  stress_a_pregnancy  child_behav  current_c_b
count               120.000000          120.000000   120.000000    120.00000
mean                  4.183333            3.425000     3.291667      3.27500
std                   0.709874            0.984438     0.956146      0.95233
min                   2.000000            1.000000     1.000000      1.00000
25%                   4.000000            3.000000     3.000000      3.00000
50%                   4.000000            4.000000     3.000000      3.00000
75%                   5.000000            4.000000     4.000000      4.00000
max                   5.000000            5.000000     5.000000      5.00000
```

Stress During Pregnancy:

The mean stress level during pregnancy in our sample is approximately 4.18, with a standard deviation of 0.71. This suggests that, on average, participants reported moderate to high levels of stress during their pregnancy. The minimum stress level reported was 2, indicating that some individuals experienced relatively low stress, while the maximum stress level reported was 5, indicating that others experienced high levels of stress. Most participants (75%) reported stress levels between 4 and 5 during pregnancy.

Stress After Pregnancy:

The mean stress level after pregnancy is slightly lower at approximately 3.43, with a standard deviation of 0.98. This indicates that, on average, participants reported slightly lower stress levels after pregnancy compared to during pregnancy. The minimum stress level reported was 1, indicating that some individuals experienced very low stress, while

the maximum stress level reported was 5, indicating that others experienced high levels of stress. Most participants (75%) reported stress levels between 3 and 4 after pregnancy.

Child Behavior Assessments:

The mean child behavior assessment score is approximately 3.29, with a standard deviation of 0.96. This suggests that, on average, participants rated their children's behavior as moderately positive. The minimum behavior assessment score reported was 1, indicating that some children exhibited behaviors perceived as less favorable, while the maximum behavior assessment score reported was 5, indicating that others exhibited highly positive behaviors. Most children (75%) received behavior assessment scores between 3 and 4.

Grown Child Behavior Assessments:

The mean assessment score for grown child behavior is approximately 3.28, with a standard deviation of 0.95. This suggests that, on average, participants rated their grown children's behavior as moderately positive. The minimum behavior assessment score reported was 1, indicating that some grown children exhibited less favorable behaviors, while the maximum behavior assessment score reported was 5, indicating that others exhibited highly positive behaviors. Similar to child behavior assessments, most grown children (75%) received behavior assessment scores between 3 and 4.

4.2 Chi-square Test

Source code:

```
# Calculate chi-square test statistics
chi2, p, dof, expected = chi2_contingency(cross_tab)
print("\nChi-square Test Statistics:")
print(f"Chi2: {chi2}")
print(f"P-value: {p}")
```

Output

```
Chi-square Test Statistics:
Chi2: 30.209382506445316
P-value: 0.016946326386391656
```

Chi-square (Chi2) value: The Chi-square statistic (Chi2) is a measure of how much the observed counts of events differ from the counts we would expect if there were no association between maternal stress levels and major life events during pregnancy. In this case, the Chi2 value is 30.209382506445316.

P-value: The p-value associated with the Chi-square statistic is a measure of the probability of obtaining the observed results (or more extreme results) if the null hypothesis were true. In this case, the p-value is 0.016946326386391656. Since the p-value (0.0169) is less than the significance level (usually set at 0.05), we reject the null hypothesis. This means that we have enough evidence to conclude that there is a significant association between maternal stress levels and major life events during pregnancy.

In simpler terms, the results suggest that maternal stress levels and major life events during pregnancy are not independent of each other. The significant association implies that as maternal stress levels change, the likelihood of experiencing major life events during pregnancy also changes, and vice versa.

4.3 Correlation

Source code:

```
# Initialize OrdinalEncoder
ordinal_encoder = OrdinalEncoder()

# Fit and transform the child behavior column
survey_data['child_behavior_encoded'] = ordinal_encoder.fit_transform(survey_data[['child_behavior']])

# Calculate Pearson correlation coefficient
correlation_coefficient, p_value = pearsonr(survey_data['maternal_stress'], survey_data['child_behavior_encoded'])

print("Pearson correlation coefficient:", correlation_coefficient)
print("P-value:", p_value)
```

```
survey_data = pd.DataFrame(data)

# Convert maternal stress ratings to numerical values
survey_data['maternal_stress'] = pd.to_numeric(survey_data['maternal_stress'], errors='coerce')

# Initialize OrdinalEncoder
ordinal_encoder = OrdinalEncoder()

# Fit and transform the child behavior column
survey_data['child_behavior_encoded'] = ordinal_encoder.fit_transform(survey_data[['child_behavior']])

# Calculate Pearson correlation coefficient
correlation_coefficient, p_value = pearsonr(survey_data['maternal_stress'], survey_data['child_behavior_encoded'])

print("Pearson correlation coefficient:", correlation_coefficient)
print("P-value:", p_value)
```

Output

```
Pearson correlation coefficient: 0.21521837653283737
P-value: 0.029019354067766134
```

```
Pearson correlation coefficient: 0.25291040876947213
P-value: 0.009952302473701942
```

Correlation of maternal stress and child behavior: Explanation: The positive Pearson correlation coefficient of approximately 0.2152 indicates a modest, yet statistically significant, positive correlation between maternal stress levels and child behavior. This suggests that as maternal stress levels increase, child behavior tends to show some degree of increase as well. The associated p-value of 0.0290 indicates that this correlation is unlikely to have occurred by random chance alone.

Conclusion: Based on these findings, we can conclude that there is a significant association between maternal stress levels and child behavior. While the correlation is relatively

modest, the statistical significance suggests that maternal stress does indeed have an impact on child behavior during their early years.

Correlation of maternal stress and grown child behavior: Explanation: The positive Pearson correlation coefficient of approximately 0.2529 indicates a modest, yet statistically significant, positive correlation between maternal stress levels and the behavior of grown children. This suggests that as maternal stress levels increase, the behavior of grown children also tends to increase to some extent. The low associated p-value of 0.00995 further supports the conclusion that this correlation is unlikely to be due to random chance.

Conclusion: Based on these results, we can conclude that there is a significant association between maternal stress levels and the behavior of grown children. Although the correlation is modest, the statistical significance suggests that maternal stress continues to have an impact on the behavior of children even as they grow older.

4.4 Regression

Source code:

```
# Define independent and dependent variables for child behavior assessment
X_child_behavior = data[['stress_during_pregnancy']]
y_child_behavior = data['child_behav']

# Add other factors such as family support and parenting style if available
# X_child_behavior['family_support'] = data['family_support']
# X_child_behavior['parenting_style'] = data['parenting_style']

# Perform linear regression for child behavior assessment
X_child_behavior = sm.add_constant(X_child_behavior)  # Add constant term
model_child_behavior = sm.OLS(y_child_behavior, X_child_behavior).fit()
print(model_child_behavior.summary())

# Define independent and dependent variables for grown child behavior
X_grown_child_behavior = data[['stress_a_pregnancy']]
y_grown_child_behavior = data['current_c_b']

# Add other factors such as family support and parenting style if available
# X_grown_child_behavior['family_support'] = data['family_support']
# X_grown_child_behavior['parenting_style'] = data['parenting_style']

# Perform linear regression for grown child behavior
X_grown_child_behavior = sm.add_constant(X_grown_child_behavior)  # Add constant term
model_grown_child_behavior = sm.OLS(y_grown_child_behavior, X_grown_child_behavior).fit()
print(model_grown_child_behavior.summary())
```

Output

```
                            OLS Regression Results
==============================================================================
Dep. Variable:            child_behav   R-squared:                       0.071
Model:                            OLS   Adj. R-squared:                  0.064
Method:                 Least Squares   F-statistic:                     9.074
Date:                Fri, 15 Mar 2024   Prob (F-statistic):            0.00317
Time:                        06:12:39   Log-Likelihood:                -159.94
No. Observations:                 120   AIC:                             323.9
Df Residuals:                     118   BIC:                             329.5
Df Model:                           1
Covariance Type:            nonrobust
==============================================================================================
                                 coef    std err          t      P>|t|      [0.025      0.975]
----------------------------------------------------------------------------------------------
const                          1.7860      0.507      3.523      0.001       0.782       2.790
stress_during_pregnancy        0.3599      0.119      3.012      0.003       0.123       0.597
==============================================================================
Omnibus:                        1.042   Durbin-Watson:                   1.708
Prob(Omnibus):                  0.594   Jarque-Bera (JB):                0.989
Skew:                          -0.022   Prob(JB):                        0.610
Kurtosis:                       2.557   Cond. No.                         26.8
```

```
                            OLS Regression Results
==============================================================================
Dep. Variable:            current_c_b   R-squared:                       0.014
Model:                            OLS   Adj. R-squared:                  0.005
Method:                 Least Squares   F-statistic:                     1.618
Date:                Fri, 15 Mar 2024   Prob (F-statistic):              0.206
Time:                        06:12:39   Log-Likelihood:                -163.09
No. Observations:                 120   AIC:                             330.2
Df Residuals:                     118   BIC:                             335.8
Df Model:                           1
Covariance Type:            nonrobust
==============================================================================
                     coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const              2.8897      0.315      9.170      0.000       2.266       3.514
stress_a_pregnancy 0.1125      0.088      1.272      0.206      -0.063       0.288
==============================================================================
Omnibus:                        0.001   Durbin-Watson:                   1.924
Prob(Omnibus):                  1.000   Jarque-Bera (JB):                0.075
Skew:                          -0.006   Prob(JB):                        0.963
Kurtosis:                       2.878   Cond. No.                         13.9
```

Model 1: Child Behavior

Dependent Variable: Child behavior (child_behav)

R-squared: The proportion of variance in child behavior that is explained by maternal stress during pregnancy. In this model, R-squared is approximately 0.071, indicating that around 7.1% of the variance in child behavior can be explained by maternal stress during pregnancy.

F-statistic: The overall significance of the regression model. Here, the F-statistic is 9.074 with a p-value of 0.00317, suggesting that the model is statistically significant.

Coefficient of stress_during_pregnancy: This coefficient (0.3599) represents the estimated change in the child behavior score for a one-unit increase in maternal stress during pregnancy, holding all other variables constant. The coefficient is statistically significant ($p < 0.05$), indicating that there is a significant association between maternal stress during pregnancy and child behavior.

Model 2: Grown Child Behavior

Dependent Variable: Grown child behavior (current_c_b)

R-squared: The proportion of variance in grown child behavior that is explained by maternal stress after pregnancy. In this model, R-squared is approximately 0.014, indicating that around 1.4% of the variance in grown child behavior can be explained by maternal stress after pregnancy.

F-statistic: The overall significance of the regression model. Here, the F-statistic is 1.618 with a p-value of 0.206, suggesting that the model is not statistically significant at the conventional significance level of 0.05.

Coefficient of stress_a_pregnancy: This coefficient (0.1125) represents the estimated change in the grown child behavior score for a one-unit increase in maternal stress after pregnancy, holding all other variables constant. However, the coefficient is not statistically significant ($p > 0.05$), indicating that there is insufficient evidence to conclude a significant association between maternal stress after pregnancy and grown child behavior.

In summary, the results suggest that maternal stress during pregnancy is significantly associated with child behavior, while there is no significant association between maternal stress after pregnancy and grown child behavior. These findings emphasize the potential impact of maternal stress during pregnancy on child behavior outcomes.

4.4 Data Visualization

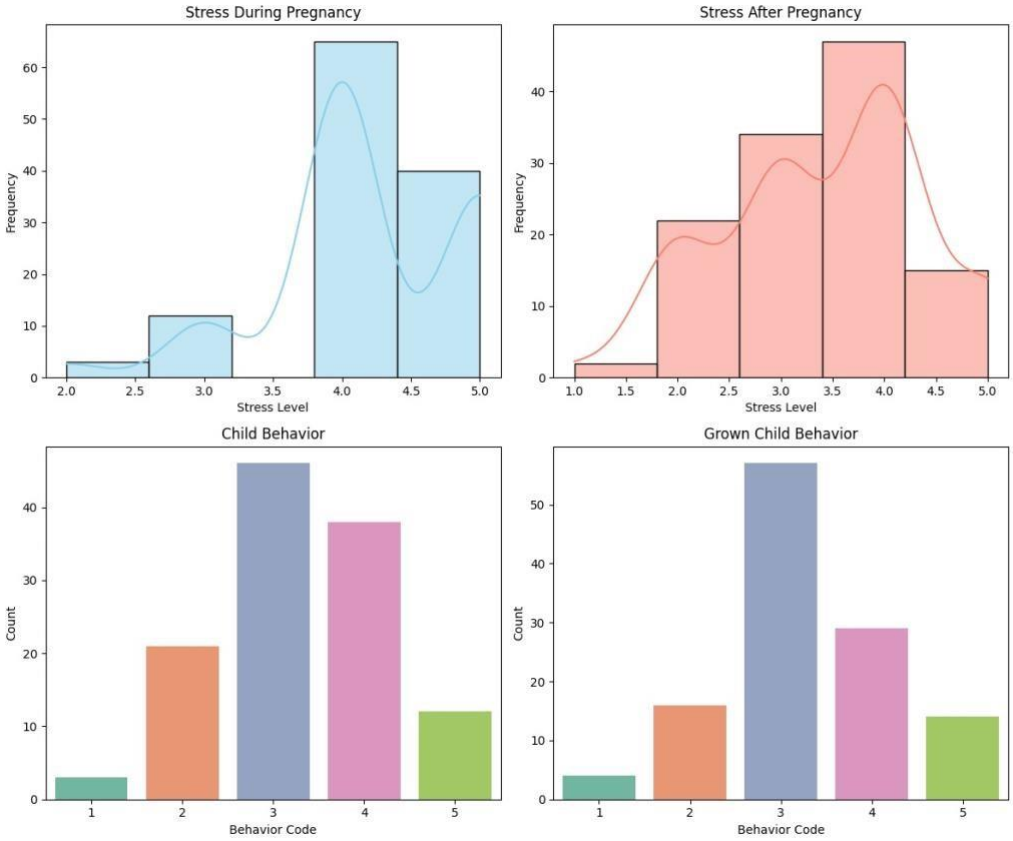

fig 4.4.1

According to the graph on stress during pregnancy, it shows that the most common stress level during pregnancy falls between 3.5 to 4.5. It appears that there are more people who experience higher stress levels during this time.On the other hand, the graph on stress after pregnancy indicates that people tend to experience lower stress levels compared to during pregnancy. The most common stress level after pregnancy is between 3.5 and 4.0. Furthermore, there is a decrease in the number of people who experience higher stress levels based on their stress levels during pregnancy.

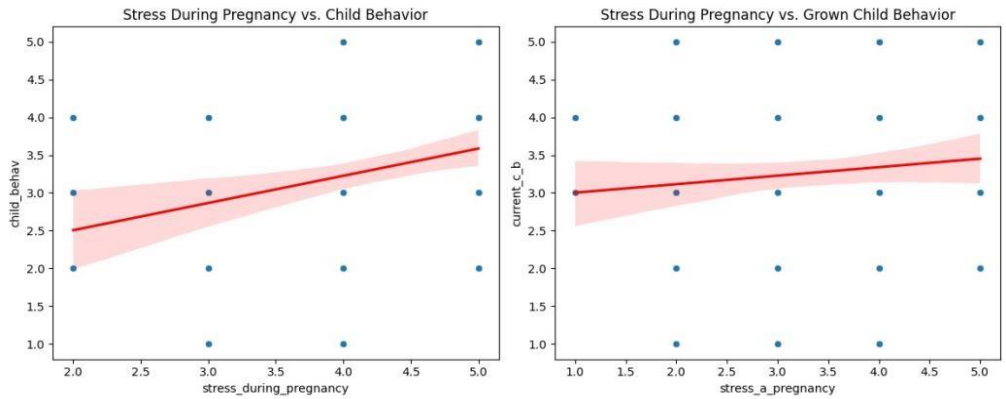

fig 4.4.2

5.CONCLUSION

This comprehensive analysis underscores the multifaceted impact of maternal stress on child behavior across different developmental stages. Our findings highlight several key points:

Firstly, maternal stress during pregnancy significantly influences child behavior, with higher stress levels correlating with an increased likelihood of major life events or changes during this critical period. This underscores the importance of addressing maternal stress as early as possible to mitigate its potential adverse effects on child development.Moreover, our analysis reveals that the impact of maternal stress extends beyond the prenatal period, influencing parenting style, interactions, and the overall environment throughout childhood and adolescence. This suggests that interventions aimed at supporting maternal mental health and promoting positive parenting practices have the potential to yield long-term benefits for child behavior and well-being.

Furthermore, our findings indicate that the influence of maternal stress on grown child behavior is particularly pronounced, underscoring the enduring effects of early life stressors on later development. This highlights the need for ongoing support and interventions for children of highly stressed mothers as they navigate the challenges of adolescence and beyond.

Lastly, specific behavioral patterns, such as hyperactivity or impulsivity, emerged as key indicators of the impact of maternal stress on child behavior. Recognizing these patterns can aid in early identification and intervention, allowing for targeted support and resources to be provided to at-risk children and their families.

Overall, this analysis emphasizes the critical role of maternal mental health in shaping child behavior and underscores the importance of implementing comprehensive strategies to support maternal well-being, promote positive parenting practices, and foster healthy child development. By addressing maternal stress and its associated impacts on child behavior, we can strive towards creating a nurturing and supportive environment that enables all children to thrive and reach their full potential.

6.FUTURE SCOPE

The study opens avenues for future research and practical actions to better understand and address the impact of maternal stress on child behavior. Future studies could track children over time to see how maternal stress affects them as they grow. Additionally, interventions can be developed to support maternal mental health during and after pregnancy. Understanding the biological mechanisms behind this connection, as well as factors that might amplify or mitigate it, is also important. Cultural differences should be considered in these studies to tailor interventions effectively. Technology can be harnessed to provide support to mothers, and policy changes are needed to improve maternal mental health services and address underlying social factors. Collaboration between researchers, policymakers, and community groups is vital to enact these changes effectively.

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