

Assessing the Impact of Paternal Presence in Prenatal Visits on The Baby's Birth Weight

The Indian Case

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Abstract

This study utilized data from the National Family Health Survey (NFHS 5, 2019-2021) to examine the hypothesis that the presence of the father during prenatal care significantly impacts the birth weight of newborns in an Indian sample. A robust regression analysis, which is less sensitive to outliers, was employed. The results indicate that the mother's report of the father's presence at antenatal visits is associated with a decrease in the baby's birth weight by approximately 26.47 grams compared to the reported father's absence, after controlling for sociodemographic factors. This study suggests that patriarchal social norms and behaviors may contribute to problematic scenarios characterized by low levels of social well-being and threats to the lives of women and children.



Acknowledgements

This work was independently prepared by me for the data analysis competition named **ABCD Hackathon 2024**, organized by The Atlas of Behavior Change in Development in collaboration with the Centre for Social and Behaviour Change. All data were extracted from the National Family Health Survey (NFHS 5, 2019-2021) and pertain to the population of India. The data cleaning and analysis were performed by me using the statistical software Stata. The writing and execution of this report in LaTeX are also solely my work. To access my do-file, please click [here](#).

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1. INTRODUCTION

According to the National Family Health Survey in India (NFHS 5, 2019-2021), 59% of women had at least four Antenatal Care (ANC) visits during their last pregnancy. However, only 52% of women are allowed to go to the health facility on their own. Furthermore, 21% of men didn't attend ANC visits because they did not feel it was necessary, nor did they allow their partner to go.

In this way, this research investigates whether a positive response to the question: "Was the (name's) father present during any of your antenatal visits?" could have an impact on the baby's birth weight. This hypothesis assumes that some women may not attend prenatal care appointments due to the husband's disapproval or belief that such visits are unnecessary. Consequently, having the father involved in prenatal care might influence the baby's health outcomes. Hence, the hypothesis of this study is as follows:

H₀: Responding "yes" to the question regarding the father's presence during antenatal visits **does not** have a significant impact on the baby's birth weight.

H₁: Responding "yes" to the question regarding the father's presence during antenatal visits **have** a significant impact on the baby's birth weight.

2. DATA AND METHODOLOGY

This brief study was conducted using birth records from the National Family Health Survey (NFHS 5) for the Indian population. The final dataset comprises 17,306 individual-level observations of women respondents and includes 25 variables, covering the period from 2019 to 2021. Below, the dependent and main independent variables are described to provide a comprehensive understanding of the subsequent data analysis.

Table 1: Dependent and Independent variables

| Variable | Relationship | Measurement | Description |
|--|---------------------------|---|--|
| Birth Weights | Dependent variable | Grams | The reported birth weight by the mom or from the written card. |
| Presence of the Father in antenatal visits | Main independent variable | Equals to 1 when "Yes" is reported and 0 otherwise. | Answer to the question: "Was the (name's) father present during any of your antenatal visits?" |

The methodology for analyzing the data is as follows: (1) descriptive statistics for the dependent variable to better understand its behavior and assess method suitability; (2) a preliminary analysis using a Spearman Correlation Test; (3) a more comprehensive analysis using Robust Regression in Stata, with control variables.

The Spearman Correlation Test and the Robust Regression methodology were chosen due to the non-parametric nature of the dependent variable and the presence of outliers. Outliers were not removed, as it was preferred to use statistical methods that can handle them effectively rather than eliminating them. Removing outliers results in information loss, and they can occasionally be valuable for understanding the relationship in question.

The Spearman Correlation test is a simple correlation between the variables of interest, and it does not assume normality. The Robust Regression technique, on the other hand, is a command in Stata which employs M-Estimators, that generalize the least squares method to be less sensitive to outliers. This method is also more flexible, as it can be adjusted for various types of data and problems.

3. PRELIMINARY ANALYSIS AND DESCRIPTIVE STATISTICS

3.1. The dependent variable: the baby's birth weight in grams

The table below presents the descriptive statistics for the dependent variable, the birth weight. The average birth weight in the sample is 2.8 kilograms, with the minimum being 500 grams and the maximum 9.9 kilograms. The standard deviation indicates that the birth weights can deviate by 573 grams from the mean. This represents a moderate to high variation, with a coefficient of variation around 20.32%.

The variable is positively skewed, indicating that some babies have significantly higher birth weights, which raises the mean. The right tail of the distribution is heavier. The kurtosis is also quite high, suggesting that the distribution has a pronounced peak and heavy tails, indicative of extreme values or outliers. In conclusion, the descriptive statistics analysis reveals that the birth weight distribution might not conform to a normal distribution.

Table 2: Descriptive Statistics from the dependent variable

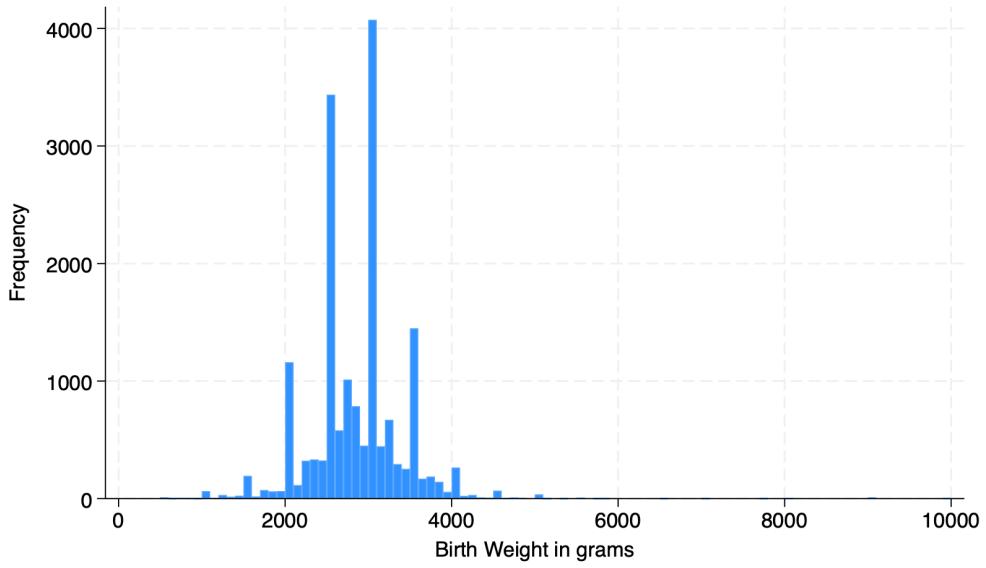
| Variable | Number of observations | Mean | Std. dev | Min | Max | Skewness | Kurtosis |
|---------------------|------------------------|----------|----------|-----|------|----------|----------|
| Baby's birth weight | 17,306 | 2824.896 | 573.9581 | 500 | 9980 | 1.140595 | 15.45077 |

Below is the histogram of the dependent variable. After performing the Shapiro-Wilk test for normality, the p-value is very low. This indicates that the null hypothesis of the test was rejected, hence, it is not possible to affirm that the data comes from a normal distribution.

3.2. The Spearman Correlation Test

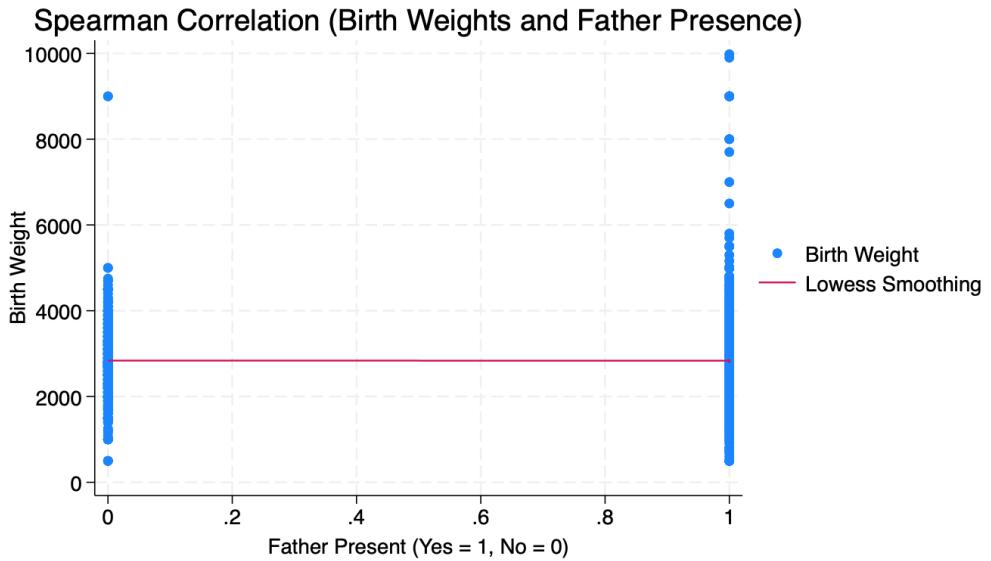
Since the data is non-parametric, the simplest analysis that can be performed is a Spearman Correlation Test, which does not assume normality, to detect a monotonic relationship between variables. The result of the test indicates that there is not enough evidence to say that the reported presence of the father at prenatal appointments predicts the baby's weight in this Indian sample. Below, a graph of this preliminary analysis is provided.

Figure 1: Histogram of the dependent variable



This graph highlights the presence of outliers in the birth weight variable, as indicated by the isolated blue dots representing extreme values. The lowess smoothing line is relatively flat, suggesting no significant relationship between variables.

Figure 2: Spearman Correlation Results



4. MAIN RESULTS

The main results of the robust regression are presented below. According to the collected sample, the reported father's presence by the mother at antenatal visits is associated with a decrease in the baby's birth weight by approximately 26,47 grams compared to the reported father's absence. This relationship is statistically significant at 5%. Other significant variables were maternal age, type of residence, education level, wealth index, ethnicity, if the child is a twin or not and if the year is 2020.

Table 3: Robust Regressions Results

| Robust Regression Results | |
|--|-------------------------------|
| VARIABLES | Birth Weight Coef. p-value |
| Presence of the Father in antenatal visits | -26.48** (12.61) |
| Maternal Age | 5.559*** (0.780) |
| State | -0.115 (0.432) |
| Type of residence (urban/rural) | -54.88*** (9.579) |
| Education Level | 37.92*** (4.794) |
| Wealth Index (urban/rural) | 28.51*** (3.173) |
| BMI (accordingly to WHO) | -0.000300 (0.000440) |
| Pre-pregnancy Condition | 16.68 (31.39) |
| Ethnicity = 992, tribe | 146.8*** (11.18) |
| Ethnicity = 993, no caste / tribe | 29.70* (17.21) |
| Ethnicity = 998, don't know | -56.44 (56.56) |
| Is a twin or not | -348.9*** (21.08) |
| Antenatal Visits | 0.0961 (0.347) |
| Effects of the Pandemic 2020 | -41.86*** (9.001) |
| Constant | 2,635*** (34.46) |
| Observations | 16,924 |
| R-squared | 0.044 |
| N | 16924 |
| r2 | 0.0435 |

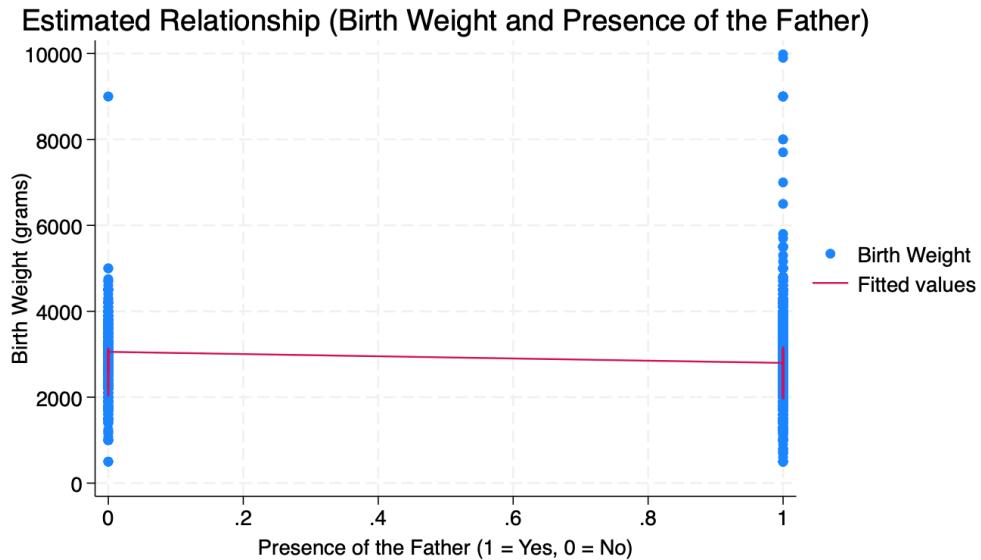
Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The graph below displays the fitted values estimated by the regression analysis. The lowess smoothing line shows a slight negative trend, indicating that if the answer

to the question is "yes", there is a tendency for the child's birth weight to decline. This suggests a negative correlation between affirmative responses to the survey question and lower birth weights, compared to negative responses.

Figure 3: Estimated relationship



Regarding other variables, it is possible to conclude that for each additional year of maternal age, the birth weight increases by approximately 5,55 grams, and this relationship is significant at 1%. Maternal age is an established predictor of the child's birth weight and delaying birth from teenage years to adulthood may improve health outcomes of the baby, even though extreme maternal ages are associated with risky pregnancies (Wang et al., 2020; Londoro et al., 2019; Gebreegziabher et al., 2023).

Living in an urban area is also a predictor of birth weights in India, being associated with a decrease in the birth weight by approximately 54,8 grams compared to living in a rural area, and this relationship is significant at 1%. Even though previous studies for India have reported the opposite association (Singh et al., 2023), research conducted in Africa have already found similar results (Mohammed et al., 2019).

Socioeconomic factors, such as income and education, are associated with an increase in the child's birth weight. Each additional level of education predicts an increase in birth weight by approximately 37.9 grams¹. Similarly, the income indicator shows that for each unit increase in the wealth index category, there is an increase in birth weight by 28.5 grams². These results are aligned with the literature on maternal and child health (Godah et al., 2021; Silvestrin et al., 2013).

Additionally, being part of a tribe is associated with an increase in birth weight of approximately 146.8 grams compared to being part of a caste – the reference category. This relationship is significant at 1%. This result is also aligned with the recent scientific production in India regarding caste disparities in accessing the health care facilities (Bansod et al., 2022; Chatterjee et al., 2023).

In the collected sample, whether a child is a twin is another significant predictor of birth weight. Specifically, being a twin is associated with a decrease in birth weight of approximately 348.9 grams. This relationship is significant at the 1% level and is consistent with findings reported in the literature (Premkumar et al., 2016; Santana et al., 2018).

Finally, the 2020 pandemic also is significantly predicting birth weights in the collected sample. In fact, birth weights in 2020 were, on average, 41.86 grams lower compared to the other years, and this relationship is significant at 1%. This variable was included due to the disruptive nature of the pandemic year, which could otherwise lead to biased estimations if not addressed separately.

5. DISCUSSION

The main result found here is not trivial to explain. Apparently, the father's participation in prenatal consultations is associated with worse outcomes in child health indicators, such as the baby's birth weight. This relationship is counter-intuitive at first

¹The levels of education in the sample were: no education (0), primary (1), secondary (2) and higher (3). The baseline category is no education. Hence, going from no education to primary education is associated with an increase of 37.9 grams in the birth weight. Similarly, an increase from 0 to 2 means leads to an increase of 75.9 grams (37.9×2) in the birth weight and an increase from 0 to 3 leads to an increase of 113.7 grams (37.9×3) in the birth weight.

²Higher wealth index categories (richer, richest) are associated with higher birth weights. Specifically, each step up in the wealth index category (from poorest to poorer, poorer to middle, middle to richer, and richer to richest) is associated with an average increase in birth weight of approximately 28.51 grams.

glance, however some plausible arguments can be explored, even though the scope of this study cannot test these hypotheses.

A mediating factor in this relationship could be related to stress levels. Marital relationships based on control and lack of female autonomy can worsen the woman's health, thereby affecting the child's health. In this case, being accompanied by the father in prenatal appointments might be capturing the impact of changes in the mental health of the interviewed women.

From another perspective, this result may be reflecting a compensatory behaviour. In this case, the father's participation in prenatal appointments might indicate the possibility of high-risk pregnancies, where medical monitoring becomes more necessary. In such cases, there could be greater efforts from the family and the husband to attend prenatal consultations.

Another point worth considering is the fact that being accompanied by the husband in prenatal consultations might actually be selecting women who already have restricted access to health services in the first place. Due to patriarchal social norms and the need for permission to travel or access certain places, these women might have worsened health conditions that are reflected in the child's well-being.

6. CONCLUSION

The analysis conducted in this study was able to reject the initially proposed null hypothesis. Hence, according to the scope of this work, answering "yes" to the question regarding the father's presence during antenatal visits does have a significant negative impact on the baby's birth weight. The result found in this study, although counter-intuitive at first, might make sense in the context of Indian society.

Future research could focus, for example, on collecting data regarding the mental health of these women and how it relates to social norms and the baby's health. Additionally, there is the possibility of omitted variable bias. In this sense, using different methodologies and investigating possible controls not included in this study are interesting extensions.

The situation where the father's presence in prenatal care worsens the baby's quality of life is a hypothesis that needs to be explored with more caution. This

study suggests that social norms and behaviours may foster problematic scenarios, characterized by low levels of social well-being and threats to the lives of women and children. However, this work does not achieve the necessary level of detail, providing only initial insights.

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