Journal of Research Administration
Society of Research Administrators International

MATERNAL AGE AT MARRIAGE AND DELIVERY: IMPLICATIONS FOR MATERNAL AND CHILD HEALTH IN RURAL AREAS IN TIRUNELVELI DISTRICT

Amala Angel Asha M[1] and **Monikanda Prasad G**[2]
[1]Research Scholar, [2]Assistant Professor,
Department of Economics, Manonmaniam Sundaranar University
Tirunelveli – 627 012. Tamil Nadu, India

Abstract

Maternal health refers to the well-being of women throughout pregnancy, childbirth, and the postnatal period. Every stage should be a positive journey, guaranteeing that women and their infants achieve their utmost potential for health and well-being. This article examines the association between maternal age at marriage, maternal age at time of delivery, and their implications for maternal and child health. The study utilizes a dataset including variables such as mother's age at marriage, mother's age at delivery, order of child alive, and nature of delivery. Cross-tabulation analysis, and correlation analysis are employed to investigate the relationship between maternal age at marriage and delivery, and their impact on various health outcomes. The results of this study can provide insights into the importance of optimal maternal age and inform public health programs targeting maternal and child well-being.

Keywords: Maternal and Child Health (MCH), Maternal age, Child birth, Rural health

1. Introduction

Maternal and Child Health (MCH) is an important public health issue (Maternal and Child Health, 2023). The age at which women get married and subsequently become mothers is a significant factor that can have implications for both maternal and child health outcomes. Maternal age at marriage and delivery has been the subject of considerable research interest, as it is believed to influence various health outcomes for both mothers and their children. Understanding the relationship between maternal age at marriage and delivery and its impact on maternal and child health is essential for informing public health policies and interventions that promote optimal health outcomes.

Research studies have consistently indicated that maternal age at marriage and delivery is associated with various health outcomes for mothers and children. Early marriage and early pregnancy, typically defined as marriage and childbirth before the age of 18, have been linked to adverse outcomes. NFHS-2's findings indicated that approximately 65 percent of births, especially in rural regions, occurred in the women's or parents' residences. Out of these births, fewer than one in seven received the attendance of a healthcare professional (Maternal Care in India Reveals Gaps between Urban and Rural, Rich and Poor, 2022).

According to a study by Raj et al. (2009), early marriage increases the risk of maternal mortality and morbidity, as young girls are often not physically and emotionally prepared for childbirth.

Early marriage is also associated with higher rates of complications during pregnancy and delivery, including preterm birth and low birth weight infants (Raj et al., 2010; Santhya & Jejeebhoy, 2015). Conversely, advanced maternal age at marriage and delivery, commonly defined as age 35 and above, has also been associated with certain risks. A study conducted by Jacobsson et al. (2004) found an increased risk of adverse birth outcomes, such as stillbirths and chromosomal abnormalities, among women of advanced maternal age. Advanced maternal age is also associated with higher rates of caesarean sections and pregnancy complications, such as gestational diabetes and hypertension (Jacobsson et al., 2004; Nybo Andersen et al., 2000).

However, it is important to note that the relationship between maternal age at marriage and delivery and health outcomes is complex and can be influenced by various factors, including socioeconomic status, education, and healthcare access. Abdullah et al. (2019) highlighted the challenges faced by pregnant women and their communities during floods, such as limited access to antenatal care and skilled attendants. In a study by Sahoo et al. (2021), they explored the challenges in accessing and continuing Maternal and Child Health (MCH) services during public health emergencies, emphasizing low utilization and safety concerns. Therefore, further research is needed to delve into the specific implications of maternal age at marriage and delivery on maternal and child health outcomes.

The aim of this study is to investigate the association between maternal age at marriage and delivery and its implications for maternal and child health. By analysing a comprehensive dataset comprising variables such as the mother's age at marriage, the mother's age at delivery, the order of living children, and the nature of delivery, we aim to provide insights into the importance of optimal maternal age and to inform public health programs targeting maternal and child well-being. The findings of this study will contribute to the existing body of knowledge on maternal and child health and can guide evidence-based interventions and policies that promote optimal health outcomes for mothers and children.

2. Methodology

Study Design: This research utilized a retrospective observational study design to examine the association between maternal age at marriage and delivery and its implications for maternal and child health. Data from a large population-based dataset were analyzed to explore the research objectives.

Data Collection: The primary data source for this study was gathered from rural areas in the Tirunelveli district, and convenience sampling was employed due to the availability of this data source. The dataset encompassed variables including the mother's age at marriage, the mother's age at delivery, the birth order of the living child, the method of delivery, and other pertinent demographic and health-related variables. All data were anonymized and de-identified prior to analysis, ensuring the confidentiality of individuals included in the dataset.

3. Statistical Analysis

1) Cross-Tabulation Analysis

Frequency distributions and percentages were generated for categorical variables such as order of child alive and nature of delivery.

a) Gender of the Babies

The frequency analysis results show the distribution of the variable" Gender of the Baby" in a dataset with a total of 139 cases (babies).

Table 1 Gender of the Babies

Baby Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	69	49.6	49.6	49.6
Male	70	50.4	50.4	100.0
Total	139	100.0	100.0	

- There are 69 cases (babies) with a sex recorded as" Female" with the percentage of females in the dataset is 49.6%.
- There are 70 cases (babies) with a sex recorded as" Male" with the percentage of males in the dataset is 50.4%.

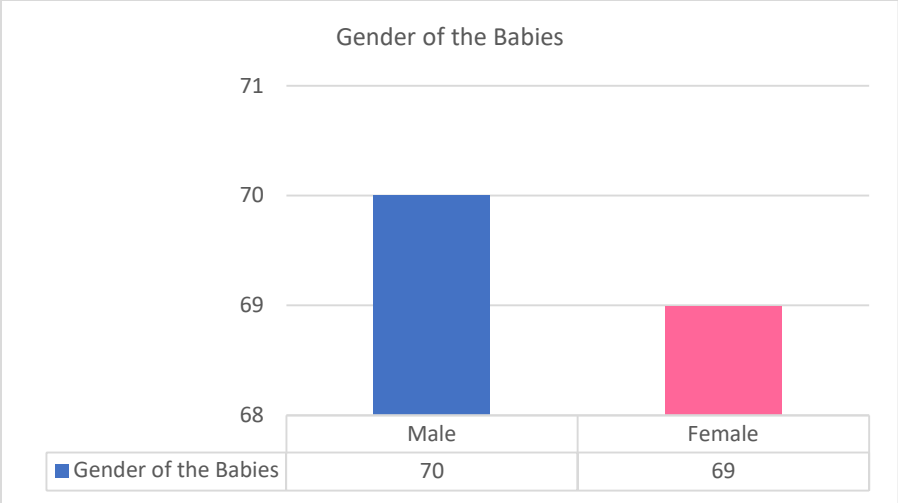

Figure 1Gender of the Babies

b) Nature of the Delivery:

Table 2 Nature of Delivery Percentage Analysis

	Frequency	Percent	Valid Percent	Cumulative Percent
LSCS	96	69.1	69.1	69.1
NORMAL	43	30.9	30.9	100.0
Total	139	100.0	100.0	

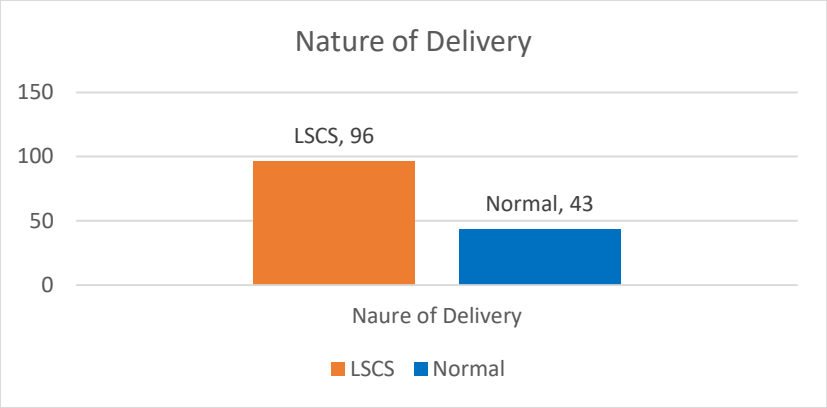

Figure 2Nature of Delivery

The figure 2 compares the number of deliveries between two categories: "Normal" and "LSCS" (Cesarean Section).

1. **Normal Deliveries:** There was a total of 43 normal deliveries, representing a certain proportion of all deliveries.
2. **LSCS (Cesarean Sections):** The number of LSCS (Cesarean Section) deliveries was significantly higher, with a total of 96 cases.

The bar plot clearly illustrates that LSCS (Cesarean Section) deliveries were more common in the dataset compared to normal deliveries. LSCS deliveries accounted for a larger percentage of all deliveries. It is essential to consider the context and medical reasons when interpreting these results. The choice between normal delivery and LSCS is typically made based on various medical factors, and the prevalence of each type may vary across different populations and healthcare settings.

2) Correlation Analysis

Correlation analysis was employed to examine the relationship between continuous variables. Specifically, the correlation coefficient was calculated to assess the strength and direction of the association between mother's age at marriage and mother's age at delivery.

The correlation is a measure of in density of linear relationship between two or more variables. The sample correlation coefficient ranges from -1 to 1:

- If r = 1, it indicates a perfect positive linear relationship, meaning that as one variable increases, the other also increases in a linear fashion.
- If r = -1, it indicates a perfect negative linear relationship, meaning that as one variable increases, the other decreases in a linear fashion.
- If r = 0, it suggests no linear relationship between the two variables.

The formula for calculating the sample correlation coefficient "r" between two variables x and y in a sample is:

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

Where, n is the number of data points in the sample. x_i and y_i are the individual data points. $\bar{x}$ and $\bar{y}$ are the sample means of x and y, respectively.

The sample correlation co-efficient is an unbiased estimate of population correlation co-efficient. The correlation co-efficient is independent of change and scale. Using test for testing the significance of an observed sample correlation co-efficient.

It is the observed, correlation co-efficient in a sample of pairs of observations from a bivariate normal population. The Prof. Fisher proved that under the null hypothesis $H_0: P = 0$ Compute the test statistic *(t)* using the following formula:

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

Where, *n* is the number of data points in the sample.

Determine the degrees of freedom (*df*) for the t-distribution, which is $df = n - 2$, where *n* is the sample size. Choose a significance level (alpha, often denoted as α), typically set at 0.05 or 0.01, to determine the critical t-value from the t-distribution table.

Table 3 Pearson Correlation for Maternal and Child

Pearson Correlation		Mother Age at Marriage	Mother Age at Time of Delivery	Weight of the Child	Pregnancy Period on Weeks + Days
Mother Age at Marriage	Correlation	1	.135	-.092	.060
	Sig. (2-tailed)		.112	.281	.480
Mother Age at Time of Delivery	Correlation	.135	1	.068	.013
	Sig. (2-tailed)	.112		.426	.878
Weight of the Child	Correlation	-.092	.068	1	.466
	Sig. (2-tailed)	.281	.426		.000
Pregnancy Period on Weeks + Days	Correlation	.060	.013	0.466**	1
	Sig. (2-tailed)	.480	.878	.000	

The above table provided displays Pearson correlation coefficients between different variables: Mother Age at Marriage, Mother Age at Time of Delivery, Weight of the Child and Pregnancy Period on Weeks + Days. The significance value (p-value) of 0.000 indicates that the observed correlation between Pregnancy Period on Weeks and Weight of the Child is statistically significant at the 0.001 level. The likelihood of observing this correlation by random chance is extremely low (less than 0.1%), suggesting that the relationship between these two variables is not due to mere random fluctuations in the data. The above table was found that the moderate positive linear relationship between a Pregnancy Period on Weeks and Weight of the Child. Hence, the correlation analysis we conclude there exists correlation between the variables.

4. Results and Discussion

Cross-tabulation analysis was performed to explore potential relationships between categorical variables. The dataset analysis revealed interesting findings regarding baby gender and the nature of delivery. In the dataset, the distribution of baby gender was nearly equal, with 49.6% recorded as "Female" and 50.4% as "Male." This balance highlights the diversity of gender among newborns in the study population. In terms of the nature of delivery, there were 43 cases of normal deliveries, indicating a certain proportion of natural childbirth. Notably, the dataset also contained a significant number of Cesarean sections (LSCS), with 96 cases in total. This high prevalence of Cesarean sections suggests the considerable use of medical interventions during childbirth.

Pearson correlation coefficients measure the strength and direction of the linear relationship between two variables. Here's an interpretation of the table:

1. **Mother Age at Marriage vs. Mother Age at Time of Delivery**: The Pearson correlation coefficient is 0.135, indicating a weak positive correlation between a mother's age at marriage and her age at the time of delivery. This suggests that as the mother's age at marriage increases, her age at the time of delivery tends to increase slightly.
2. **Mother Age at Marriage vs. Weight of the Child**: The Pearson correlation coefficient is -0.092, indicating a weak negative correlation between a mother's age at marriage and the weight of the child. This suggests that as the mother's age at marriage increases, the weight of the child tends to decrease slightly, although the correlation is weak.
3. **Mother Age at Marriage vs. Pregnancy Period on Weeks + Days**: The Pearson correlation coefficient is 0.060, indicating a weak positive correlation between a mother's age at marriage and the pregnancy period (in weeks and days). This means that as the mother's age at marriage increases, the length of the pregnancy tends to be slightly longer.
4. **Mother Age at Time of Delivery vs. Weight of the Child**: The Pearson correlation coefficient is 0.068, indicating a weak positive correlation between a mother's age at the time of delivery and the weight of the child. This suggests that as the mother's age at the time of delivery increases, the weight of the child tends to increase slightly.
5. **Mother Age at Time of Delivery vs. Pregnancy Period on Weeks + Days**: The Pearson correlation coefficient is 0.013, indicating a very weak positive correlation between a mother's age at the time of delivery and the length of the pregnancy (in weeks and days). The correlation is extremely weak, suggesting that there is almost no relationship between these variables.
6. **Weight of the Child vs. Pregnancy Period on Weeks + Days**: The Pearson correlation coefficient is 0.466, indicated as "0.466**." This strong positive correlation suggests that there is a significant relationship between the weight of the child and the length of the pregnancy. As the pregnancy period (in weeks and days) increases, the weight of the child tends to increase significantly.

The correlation analysis between Pregnancy Period on Weeks + Days and Weight of the Child indicates that there is a statistically significant moderate positive relationship between the length

of the pregnancy and the birth weight of the child. This means that, on average, as the duration of the pregnancy increases, the baby's weight tends to increase as well, with a correlation coefficient of 0.466 indicating a moderate strength of association. However, it's important to remember that correlation does not imply causation, and other factors might also influence the birth weight of the child.

Limitations: Key limitations of this study include potential biases or limitations associated with data quality and completeness due to convenience sampling. The retrospective nature of the study design limits the ability to establish causality. Lastly, the study's focus on a specific population or region may limit its generalizability to other settings.

7. Summary and Conclusion

In this study, an analysis of a dataset containing information on births in the Tirunelveli district revealed important insights. The dataset showed nearly equal distribution between male and female births, with a slight majority of male births. Cesarean section deliveries were notably more frequent than normal deliveries. Correlation analysis among variables such as mother's age at marriage, mother's age at time of delivery, child's weight, and pregnancy period uncovered several relationships. Particularly, a strong positive correlation was found between pregnancy period and child's weight, indicating that as the pregnancy duration increased, the child's weight tended to be higher. This relationship was statistically significant, suggesting a non-random connection. In conclusion, this analysis reveals meaningful associations among these variables, providing valuable insights into birth outcomes in the study area.

Acknowledgments

The first author expresses her gratitude to Manonmaniam Sundaranar University for providing financial support to carry out this research work under the Bharat Ratna Dr. M. G. Ramachandran Centenary Research Fellowship scheme.

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