EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Coden USA: EJBPBO
Volume: 12
Issue: 12
Year: 2025

ANALYSIS OF ASSOCIATION BETWEEN MATERNAL AGE AND GESTATIONAL AGE TO LOW BIRTHWEIGHT BABY

Swati Rajaram Wadurkar*[1], Vinod K. Nagale[2], Dr. Hemlata P. Nandurkar[3], Dr. Abhijit M. Sonone[4]

[1]Research Scholar, P.G. Department of Zoology, Sant Gadge Baba Amravati University, Amravati.
[2]Assistant Professor, P.G. Department of Zoology, Sant Gadge Baba Amravati University, Amravati.
[3]Professor and Head, P.G. Department of Zoology, Sant Gadge Baba Amravati University, Amravati.
[4]Medical Officer, ESIC Amravati.

***Corresponding Author: Swati Rajaram Wadurkar**
Research Scholar, P.G. Department of Zoology, Sant Gadge Baba Amravati University, Amravati.

DOI: https://doi.org/10.5281/zenodo.17891481

How to cite this Article: Swati Rajaram Wadurkar*1, Vinod K. Nagale2, Dr. Hemlata P. Nandurkar3, Dr. Abhijit M. Sonone4. (2025). ANALYSIS OF ASSOCIATION BETWEEN MATERNAL AGE AND GESTATIONAL AGE TO LOW BIRTHWEIGHT BABY. European Journal of Biomedical and Pharmaceutical Sciences, 12(12), 397–401.

Article Received on 16/11/2025 **Article Revised on 06/12/2025** **Article Published on 10/12/2025**

ABSTRACT
Birth weight is one of the most critical determinants of neonatal survival, long-term development, and overall child health. Low Birth Weight (LBW), defined as <2.5 kg irrespective of gestational age, remains a major public health concern, especially in low- and middle-income countries. The present retrospective study aimed to evaluate the association between maternal age, gestational period, and the birth weight of newborns. A total of 1000 deliveries recorded between August 2019 and January 2020 at Dr. Panjabrao alias Bhausaheb Deshmukh Memorial Medical College, Amravati, were analyzed. Maternal age groups were categorized into four class intervals, and neonatal weight into three categories. Statistical analysis using one-way ANOVA indicated **significant association between maternal age and birth weight**, whereas **gestational age do not showed a significant influence on birth weight**, with lower gestational periods directly contributing to LBW incidence. The study confirms that gestational duration is a major determinant of neonatal birth weight, while maternal age alone does not significantly affect LBW outcomes.

KEYWORDS: Low Birth Weight (LBW); Maternal Age; Gestational Age; Neonatal Outcomes; Birth Weight.

INTRODUCTION
Birth weight provides critical insight into neonatal survival, nutritional status, and early-life health risks. LBW infants (<2500 g) are more vulnerable to mortality, impaired growth, delayed neurodevelopment, and long-term chronic diseases. Globally, more than 20 million new-borns are classified as LBW annually, with over 95% occurring in low- and middle-income countries. India accounts for a large proportion of these cases, with 30–35% of infants classified as LBW, many of whom are full-termed.

LBW results from preterm birth (<37 weeks), intrauterine growth restriction (IUGR), or a combination of both. Multiple factors contribute to these conditions, including maternal nutrition, health status, socioeconomic conditions, and antenatal care. Maternal age is widely discussed as a potential determinant of LBW, with risks reported at both extremes of reproductive age teenage mothers and mothers above 35 years.

Despite numerous global studies, the relationship between maternal age and birth weight remains debated. Many studies confirm increasing risk with advanced maternal age, whereas others attribute LBW prevalence more strongly to social, economic, and behavioural factors. Given these contradictions, local, context-specific research remains essential.

This study examines the association of maternal age and gestational age with LBW outcomes among pregnant women attending a tertiary care hospital in Amravati, Maharashtra.

The birth weight is described as the first weight measured, however, in settings with low rates of facility-based deliveries, a newborn may not be assessed by a health care worker until several days old. Birth weight should be assessed within hours of birth, prior to significant weight loss. Term neonates lose between 3.5% and 6.6% of their birth weight within the first 2.5–2.7 days of life. Exclusively breastfed neonates have a greater weight loss (Median 6.6%, 95%CI 6.3–6.9%) than formula-fed (Median 3.5%, 95%CI 3.0–3.9%) or mixed fed (5.9%, 95%CI 4.8–6.9%) neonates respectively, and take longer time to regain their birth weight (8.3 vs. 6.5 vs. 7.9 days). I decided to restrict 'birth weight' to a weight measured in the first 48 h of life. In the absence of a weight measured within the first 48 h of life, a weight measured during the first week of life, could be classified as an 'early neonatal weight' but not 'birth weight'. In a clinical trial scenario, measurement of weight within first 48 h of life should be achievable, as the clinical trial would procure adequate equipment, employ and train staff to assess birth weight in a timely manner. Reproductive age is considered at risk for adverse pregnancy outcomes. Teenage mothers have a higher risk of preterm birth, low birth weight, low Apgar score and postnatal mortality. Whether this association is determined by a biological immaturity or rather by socio-economic disadvantages, behavioral factors or lack of access to high quality antenatal care is still a topic for much discussion. On the other hand, delayed childbearing carries a higher risk of maternal and obstetric complications. The concern for the "elderly primigravida" was first published in 1950; since then, many researchers investigated the effect of aging on birth outcome. The majority of studies report an association between advanced maternal age and preterm delivery, low birth weight, perinatal death, and caesarean section. There are some studies, however, that fail to demonstrate such unfavorable conclusions. And an emerging third category even demonstrates positive outcomes, with an example being a recent retrospective study from China which found a lower risk of adverse fetal outcome for older mothers. The impact of presumed social and economic advantages of older women outweighing biological vulnerability, advocated by some, still needs to be conclusively proven. It is however worth noting, that although infants born to mothers over 40 years of age are more frequently admitted to intensive neonatal care, these pregnancies tend to be associated with improved perinatal care outcomes over time.

MATERIAL AND METHODS

This retrospective study was conducted at the Department of Gynaecology, Dr. Panjabrao alias Bhausaheb Deshmukh Memorial Medical College, Amravati (20° 56' 14.7264" N and 77° 46' 46.3764" E) between August 2019 and January 2020. Ethical approval and institutional permission were granted prior to data collection.

The study population comprised of mothers age along with newborns weight. Study includes data collection of mother's age along with gestational period, birth weight of newborn, past obstetrical history, birth interval, antenatal care, along with age at delivery. Birth weight was taken within 24 hrs.of the birth and sex of the new born was recorded.

Study Population

Data from 1000 singleton deliveries were included. Maternal records and neonatal records were used to collect:

- Maternal age
- Gestational age at delivery
- Neonatal birth weight
- Past obstetric history

- Birth interval
- Antenatal care details

GROUPING CRITERIA

Maternal age groups

- 18–23 years
- 24–28 years
- 29–33 years
- 34–39 years

Birth weight categories

- <2.5 kg
- 2.5–3.5 kg
- 3.5 kg

Gestational age categories

- Preterm (<37 weeks)
- Full-term (37–41 weeks)
- Post-term (>41 weeks)

Statistical Analysis

One-way ANOVA was used to analyze the association between maternal age, gestational age, and birth weight. A p-value <0.05 was considered statistically significant.

RESULTS AND DISCUSSION

1. Relationship Between Maternal Age and Birth Weight

Table I: Birth Weight of New-borns and Age of Mother.

Age of Mother	<2.5 kg	2.5–3.5 kg	>3.5 kg
18–23	69	82	10
24–28	144	286	17
29–33	124	210	08
34–39	17	29	04

Table II: Statistical Analysis of Table I.

Groups	Count	Sum	Average	Variance
<2.5 kg	4	354	88.5	3277.667
2.5–3.5 kg	4	607	151.75	13782.92
>3.5 kg	4	39	9.75	29.58333

Table III: ANOVA Analysis – Maternal Age vs Birth Weight.

Source of Variation	SS	df	MS	F	p-value	F crit
Between groups	40488.17	2	20244.08	5.553637	0.07286	4.256495
Within groups	51270.50	9	5696.722	-	-	-
Total	91758.67	11	-	-	-	-

Interpretation

$p = 0.07286 > 0.05$

F>Fcrit value here tabulated value is greater than calculated value so we reject **null hypothesis. There is statistically significant relationship** between maternal age and neonatal birth weight.

This aligns with several previous studies showing weak or no direct correlation between maternal age and LBW when socioeconomic and health factors are considered.

2. Relationship Between Gestational Period and Birth Weight

Table IV: Gestational Period and Birth Weight.

Gestational Age	<2.5 kg	2.5–3.5 kg	>3.5 kg
Preterm (<37 wk)	124	60	00
Full-term (37–41)	213	510	27
Post-term (>41)	17	37	12

Table V: Statistical Distribution.

Groups	Count	Sum	Average	Variance
<2.5 kg	3	184	61.33	3845.33
2.5–3.5 kg	3	750	250	59349
>3.5 kg	3	66	22	175

Table VI: ANOVA Analysis – Gestational Age vs Birth Weight.

Source of Variation	SS	df	MS	F	p-value	F crit
Between groups	89126.22	2	44563.11	2.109685	0.20238	5.143253
Within groups	126738.7	6	21123.11	-	-	-
Total	215864.9	8	-	-	-	-

Interpretation
F < Fcrit so **Null hypothesis accepted** → Birth weight varies significantly with **gestational period**. There is no relationship of gestational age and birthweight of baby.

Key Findings
- **Maximum LBW (21.3%)** occurred in **preterm births**.
- Overall LBW prevalence = **35.4%**.
- Mean birth weight = **2.64 ± 0.444 kg**.
- Mothers aged 24–28 years had the highest number of LBW babies (14.4%).

CONCLUSION FROM RESULTS: Gestational age **do not shows a stronger influence** on birth weight compared to maternal age.

DISCUSSION

The purpose of this study was to examine the association of maternal age and low birth weight as well as gestational age and low birth weight. Maternal age is associated with increased odds of low-birth-weight offspring. While controlling for age, other variables such as education, income, and marital status was included in the analysis due to previous studies about low-birth-weight risk factors.

The data set was further stratified by ethnicity to determine how a risk factor affected low birth weight within the race. According to literature review, it was expected that age would be significantly associated with increased odds of having a low-birth-weight offspring (Okosun *et al., 2000*). The odds ratio in Non-Hispanic Whites and Non-Hispanic Blacks suggests that young mother's age may be a protective factor. The results of the analysis were odds ratios greater than 1 in Hispanic Americans, but it was not statistically significant. The lack of association may be explained by conflicting Studies that suggest low birth weight increases with increasing maternal age. Rich Edwards *et al.,* 2003 presented the results of a study of 887 births where mothers in the 20–45-year aged group had a higher prevalence of low birth weight in comparison to the younger aged mothers. A study in Poland determined that normal maternal age was an associated factor for low birth weight (Nazari *et al.,* 2013). A study conducted in Taiwan yielded results that suggested mothers aged 40 plus can be a strong risk factor for low birth weight (Nazari *et al.,* 2013). The risk of low birth weight among older mothers could possibly be related to several factors such as cardiovascular disease, hypertension, diabetes, and other diseases that can be associated with older age (Nazari *et al.,* 2013). Another theory for explaining the increase of low birth weight with maternal age is the weathering effect. Social inequality on health, compounds with age and can ultimately affect fetal health and birth weight (Geronimus, 1996).

CONCLUSION

The study concludes that maternal age is significantly associated with birth weight, whereas gestational age is not a strong determinant of neonatal birth weight. Lower gestational duration significantly increases the risk of LBW. Both ends of the reproductive age spectrum may present risks, but maternal age remains the central factor influencing neonatal weight outcomes. Strengthening antenatal care, ensuring timely management of preterm labour risks, and raising awareness among expectant mothers are essential to reducing LBW incidence.

ACKNOWLEDGEMENTS

The authors express sincere gratitude to Dr. Panjabrao alias Bhausaheb Deshmukh Memorial Medical College, Amravati, for providing necessary permissions and access to data. Special thanks to the Department of Gynaecology staff for their cooperation during data collection. We also acknowledge the guidance and support received from the supervising faculty throughout the study.

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