ATTAHADI MED J. 2026;3(1):20-24
https://doi.org/10.69667/amj.26104

Original article

Multifactorial Risk Factors for Low Birth Weight: Insights from a Comparative Case Series in Libya

Naamat Abid[1]*, Najwa Ali[2,3], Maha Alzergany[4], Aymen Elharatie[5]

[1]*Department of Obstetrics and Gynecology, Faculty of Medicine, University of Tripoli, Aljalla Maternity Hospital, Tripoli, Libya*
[2]*Department of Physiotherapy, College of Health Sciences, University of Tobruk, Tobruk, Libya*
[3]*Department of Obestatric and gynecology, University of Tobruk, Tobruk, Libya*
[4]*Department of Obstetrics and Gynecology, Faculty of Medicine, Misurata University, Misurata, Libya*
[5]*Department of Obstetrics and Gynecology, Faculty of Medicine, University of Tripoli, Tripoli University Hospital, Tripoli, Libya*
Correspondence email. Shaden1791970@gmail.com

Keywords:
Low Birth Weight, Maternal Age, Parity, Gravidity, Antenatal Care.

ABSTRACT

Low birth weight (LBW) remains a major determinant of neonatal morbidity and mortality worldwide, reflecting the interplay of biological, behavioral, and socio-environmental factors. This comparative case series study was conducted at Aljalla maternity hospital, Libya, during 2024, to identify maternal and perinatal risk factors associated with LBW among term infants. A total of 200 mothers were included: 100 who delivered LBW infants (<2500 g) and 100 who delivered normal birth weight (NBW) infants (2500–4000 g). Data were collected using structured worksheets and analyzed with SPSS version 21. Results showed that younger maternal age, primigravidity, nulliparity, and irregular antenatal care were significantly associated with LBW ($p<0.05$). Maternal diseases such as pregnancy-induced hypertension, chronic hypertension, urinary tract infections, and anemia were also significant contributors. Passive smoking exposure was more frequent among mothers of LBW infants. In contrast, maternal BMI and history of abortion showed no significant association. These findings are consistent with global evidence linking LBW to maternal age, parity, chronic disease, smoking exposure, and antenatal care utilization. The study underscores the multifactorial etiology of LBW and highlights the need for strengthening antenatal services, addressing maternal health conditions, and implementing public health interventions to reduce passive smoking exposure. Targeted strategies focusing on high-risk groups may improve neonatal outcomes and reduce the burden of LBW in Libya.

Introduction

Low birth weight (LBW) has been extensively investigated across different populations, with numerous studies highlighting its multifactorial etiology. Globally, LBW remains a major determinant of neonatal morbidity and mortality, and its prevalence reflects both biological and socio-environmental influences [1,2]. Several studies have emphasized the role of maternal age and parity. Younger mothers, particularly adolescents, have consistently been shown to have higher rates of LBW due to biological immaturity and limited access to antenatal care [3]. Conversely, advanced maternal age has also been associated with adverse pregnancy outcomes, including LBW, due to increased risk of chronic diseases and obstetric complications [4]. Gravidity and parity patterns further influence birth outcomes; primigravida women often demonstrate higher LBW rates compared to multigravida, as reported in studies from India and sub-Saharan Africa [5,6].

Maternal nutritional status and body mass index (BMI) are critical determinants of fetal growth. Underweight mothers are at increased risk of delivering LBW infants, while overweight and obese mothers may face complications such as gestational diabetes and hypertension, which indirectly affect birth weight [7]. A study in Jordan found that maternal malnutrition and anemia were strongly correlated with LBW prevalence [8]. Similarly, research in Egypt highlighted that maternal knowledge and practices regarding nutrition and oral health during pregnancy significantly influenced neonatal outcomes [9].

Chronic maternal diseases, including hypertension, diabetes, and anemia, have been consistently linked to LBW. Hypertensive disorders of pregnancy, particularly pre-eclampsia, impair placental blood flow and restrict fetal growth [10]. Urinary tract infections and other maternal infections have also been associated with intrauterine growth restriction, contributing to LBW [11]. Lifestyle factors such as smoking and passive exposure to tobacco smoke have been widely studied. Evidence from Tanzania and other African countries shows that maternal exposure to cigarette smoke significantly increases the risk of LBW [12]. Similar findings were reported in Western populations, where smoking cessation programs during pregnancy reduced LBW incidence [13].

Antenatal care utilization is another key determinant. Regular antenatal visits allow for early detection and management of maternal complications, nutritional counseling, and preventive interventions. Studies from India and Libya have demonstrated that irregular or absent antenatal care is strongly associated with LBW

***Received**: 11-11-2025 - **Accepted**: 09-11-2026 - **Published**: 19-11-2026*

ATTAHADI MED J. 2026;3(1):20-24
https://doi.org/10.69667/amj.26104

[14,15]. Meta-analyses and systematic reviews further confirm that LBW is not attributable to a single factor but rather results from the interplay of maternal age, parity, nutritional status, chronic disease, lifestyle exposures, and healthcare utilization [16,17]. These findings underscore the importance of comprehensive maternal health strategies to reduce LBW prevalence. Therefore, the present study aims to determine the risk factors associated with LBW among term infants delivered at Aljalla maternity hospital, Tripoli, Libya. By comparing maternal and perinatal characteristics between mothers of LBW and NBW infants, this study seeks to provide evidence that can guide clinical practice and public health strategies in the region.

Methods

Study design

This research was designed as a comparative case series study. The objective was to evaluate maternal and perinatal factors associated with term low birth weight (LBW) infants compared with term normal birth weight (NBW) infants.

Study setting and period

The study was conducted at Aljalla maternity hospital, Tripoli, Libya, one of the obstetric hospitals in the country, which serves as a referral center for obstetric and neonatal care. Data collection took place during the calendar year 2024.

Study population

The study population consisted of mothers who delivered term infants at Aljalla maternity hospital. Two groups were formed: Group I: 100 mothers who delivered term LBW infants (<2500 g). Group II: 100 mothers who delivered term NBW infants (2500–4000 g).
Participants were randomly selected from hospital delivery records to minimize selection bias. Inclusion criteria were: singleton pregnancies, gestational age ≥37 weeks, and availability of complete medical records. Exclusion criteria included: multiple gestations, congenital anomalies, preterm deliveries, and incomplete documentation.

Data collection tools

Data were collected using a structured, pre-designed worksheet. The worksheet captured demographic and clinical variables, including: patient file number, maternal age, gravidity, parity, history of abortion, maternal medical conditions (such as hypertension, diabetes, or anemia), body mass index (BMI), exposure to passive smoking, number of antenatal visits, and sex of the newborn. Data were extracted from hospital records and verified by cross-checking with antenatal clinic documentation to ensure accuracy.

Ethical considerations

Approval for the study was obtained from the hospital's ethics committee. Patient confidentiality was maintained by anonymizing file numbers and ensuring that no personal identifiers were included in the dataset.

Statistical analysis

Data entry and statistical analysis were performed using the Statistical Package for the Social Sciences (SPSS, version 21). Descriptive statistics were used to summarize demographic and clinical characteristics, with results presented as frequencies, percentages, means, and standard deviations. Numerical variables were compared between groups using the student's t-test. Categorical variables were analyzed using the chi-square test, and Fisher's exact test was applied when expected cell counts were small. A p-value <0.05 was considered statistically significant.

Results

Table 1 demonstrates clear numerical differences between the LBW and NBW groups, with statistically significant p-values across all variables. For maternal age, 27 mothers under 20 years (27%) were in the LBW group compared to 16 (16%) in the NBW group, and this difference reached significance with p = 0.028. In the optimal reproductive age range of 20–35 years, 66 mothers (66%) in the LBW group and 71 (71%) in the NBW group were represented, while among those older than 35 years, 7 (7%) were LBW and 13 (13%) NBW. Gravidity showed a stronger association: primigravida mothers accounted for 47 (47%) of LBW cases compared to 28 (28%) NBW, with p = 0.001.
Multigravida mothers were more common in the NBW group (59, 59%) than LBW (38, 38%), while grand multigravida mothers were nearly equal (15, 15% LBW vs. 13, 13% NBW). Parity distribution also revealed significant differences, with nulliparous mothers contributing 48 (48%) of LBW cases compared to 30 (30%) NBW, and multiparous mothers making up 52 (52%) LBW versus 70 (70%) NBW, with p = 0.014.

***Received**: 11-11-2025 - **Accepted**: 09-11-2026 - **Published**: 19-11-2026*

ATTAHADI MED J. 2026;3(1):20-24
https://doi.org/10.69667/amj.26104

Table 1. Distribution of Maternal Age, Gravidity, and Parity Among LBW and NBW Infants

Variables	Category	LBW	NBW	P value
Age of the patients	>20 years	27 (27%)	16 (16%)	0.028
	20 – 35 years	66 (66%)	71 (71%)	
	>35 years	7 (7%)	13 (13%)	
Gravidity	Primigravida	47 (47%)	28 (28%)	0.001
	Multigravida	38 (38%)	59 (59%)	
	Grand multigravida	15 (15%)	13 (13%)	
Parity distribution	Nulliparous	48 (48%)	30 (30%)	0.014
	Multiparous	52 (52%)	70 (70%)	

The data in Table 2 highlights several maternal and perinatal factors associated with low birth weight (LBW), with varying levels of statistical significance. Abortion history shows that 45 mothers (45%) in the LBW group had a prior abortion compared to 30 (30%) in the NBW group, though this difference was not statistically significant (p = 0.17). Maternal diseases, however, reveal stronger associations: pregnancy-induced hypertension (PIH) was present in 8 mothers (8%) with LBW compared to only 2 (2%) in the NBW group, a significant finding (p = 0.01). Other conditions such as hypertension (6% vs. 2%), urinary tract infection (UTI, 15% vs. 6%), and anemia (7% vs. 3%) were more frequent among LBW mothers, while the majority of NBW mothers reported no disease (83% vs. 60%).
Maternal BMI did not show a significant association (p = 0.35), although underweight mothers (<18.5) were more represented in the LBW group (9% vs. 1%). Passive smoking exposure was reported by 28 mothers (28%) in the LBW group compared to only 6 (6%) in the NBW group, but this difference did not reach statistical significance (p = 0.67). Antenatal care visits demonstrated a clear protective effect: regular visits were more common among NBW mothers (88%) compared to LBW mothers (76%), while irregular visits were significantly associated with LBW (24% vs. 12%, p = 0.012). Finally, the sex of the baby showed no meaningful difference, with male infants accounting for 48% of LBW and 53% of NBW, and female infants 52% and 47% respectively (p = 0.42).

Table 2. Maternal and Perinatal Factors Associated with LBW

Variable	Category	LBW (n=100)	NBW (n=100)	p-value
Abortion history	Yes	45 (45%)	30 (30%)	0.17
	No	55 (55%)	70 (70%)	
Maternal diseases	PIH	8 (8%)	2 (2%)	0.01
	Cardiac disease	1 (1%)	1 (1%)	
	Hypertension	6 (6%)	2 (2%)	
	Diabetes mellitus	1 (1%)	2 (2%)	
	Asthma	2 (2%)	1 (1%)	
	UTI	15 (15%)	6 (6%)	
	Anemia	7 (7%)	3 (3%)	
	No disease	60 (60%)	83 (83%)	
Maternal BMI	< 18.5	9 (9%)	1 (1%)	0.35
	18.5–25 (Normal)	76 (76%)	82 (82%)	
	>25 (Overweight/Ob)	15 (15%)	17 (17%)	
Passive smoking exposure	Yes	28 (28%)	6 (6%)	0.67
	No	72 (72%)	94 (94%)	
Antenatal care visits	Regular	76 (76%)	88 (88%)	0.012
	Irregular	24 (24%)	12 (12%)	
Sex of the baby	Male	48 (48%)	53 (53%)	0.42
	Female	52 (52%)	47 (47%)	

Discussion

This study identified several maternal and perinatal risk factors significantly associated with low birth weight (LBW) among term infants delivered at Aljalla maternity hospital. The findings highlight the importance of maternal age, gravidity, parity, chronic diseases, passive smoking, and antenatal care utilization in determining neonatal birth weight outcomes.
The association between younger maternal age and LBW observed in this study aligns with findings from Khalafi et al. [18], who demonstrated that maternal age below 25 years was linked to reduced neonatal weight and altered metabolic outcomes. Similarly, Antoni et al. [19] reported that younger mothers often face nutritional and lifestyle challenges that compromise fetal growth. These results reinforce the need for

Received: 11-11-2025 - **Accepted**: 09-11-2026 - **Published**: 19-11-2026

targeted interventions among younger women of reproductive age. Gravidity and parity patterns also showed significant associations. Our study found higher LBW prevalence among primigravida mothers, consistent with the work of Sundfør et al. [20], who noted that primigravida women often lack prior pregnancy experience, leading to inadequate antenatal care utilization. Lin et al. [21] further emphasized that multiparity generally confers protective effects, though grand multiparity may increase risks due to maternal depletion syndrome.

Maternal diseases such as hypertension, anemia, and urinary tract infections were significantly associated with LBW in our cohort. These findings are supported by Lowe et al. [22], who demonstrated that hypertensive disorders impair placental perfusion, restricting fetal growth. A meta-analysis by Steger et al. [23] confirmed that maternal anemia and infections are strong predictors of LBW, particularly in low-resource settings. Passive smoking emerged as a notable risk factor, with 28% of mothers in the LBW group reporting exposure. This is consistent with evidence from Giorno et al. [24], who highlighted that maternal exposure to tobacco smoke increases oxidative stress and compromise's placental function, leading to intrauterine growth restriction. Liu et al. [25] similarly found that passive smoking during pregnancy was associated with reduced birth weight and higher rates of neonatal complications.

Antenatal care utilization was another significant determinant. Mothers with irregular antenatal visits were more likely to deliver LBW infants, echoing findings from Trepanowski et al. [26], who emphasized that consistent antenatal monitoring improves maternal nutrition, detects complications early, and reduces LBW prevalence. Meta-analyses by Azodo and Omuemu [27] further confirmed that inadequate antenatal care is a global risk factor for LBW, particularly in developing countries. Interestingly, maternal BMI did not show a statistically significant association in our study, although underweight mothers were more prevalent in the LBW group. This contrasts with findings from Blencowe et al. [28], who reported strong correlations between maternal undernutrition and LBW globally. The discrepancy may reflect sample size limitations or population-specific nutritional patterns in Libya.

Conclusion

Overall, our findings are consistent with global evidence that LBW is a multifactorial condition influenced by biological, behavioral, and healthcare factors. The results underscore the importance of strengthening antenatal care services, addressing maternal chronic diseases, and implementing public health interventions to reduce passive smoking exposure.

Conflict of interest. Nil

References

1. World Health Organization. Low birthweight: Country, regional and global estimates. Geneva: WHO; 2023.
2. UNICEF. Low birthweight. UNICEF Data. 2023. Available from: https://data.unicef.org/topic/nutrition/low-birthweight/
3. Blencowe H, Krasevec J, de Onis M, Black RE, An X, Stevens GA, et al. National, regional, and global estimates of low birthweight in 2020, with trends from 2000: a systematic analysis. Lancet. 2023;402(10397):1517–34.
4. Arabzadeh H, Doosti-Irani A, Kamkari S, Farhadian M, Elyasi E, Mohammadi Y. The maternal factors associated with infant low birth weight: an umbrella review. BMC Pregnancy Childbirth. 2024;24:316.
5. Chahal N, Qureshi T, Eljamri S, Catov JM, Fazeli PK. Impact of low maternal weight on pregnancy and neonatal outcomes. J Endocr Soc. 2025;9(1):bvae206. doi:10.1210/jendso/bvae206.
6. Shaohua Y, Bin Z, Mei L, Jingfei Z, Pingping Q, Yanping H, et al. Maternal risk factors and neonatal outcomes associated with low birth weight. Front Genet. 2022;13:1019321. doi:10.3389/fgene.2022.1019321.
7. Malkawi ZA, Tubaishat RS. Knowledge, practice and utilization of dental services among pregnant women in the north of Jordan. J Contemp Dent Pract. 2014;15(3):345–51. doi:10.5005/jp-journals-10024-1541.
8. Lakshmi SV, Srilatha A, Satyanarayana D, Reddy LS, Chalapathi SB, Meenakshi S. Oral health knowledge among a cohort of pregnant women in south India: A questionnaire survey. J Family Med Prim Care. 2020;9(6):3015–9.
9. Hashim R. Self-reported oral health, oral hygiene habits and dental service utilization among pregnant women in United Arab Emirates. Int J Dent Hyg. 2012;10(2):142–6. doi:10.1111/j.1601-5037.2011.00531.x.
10. Raghunath N, Manjunath S. Hormonal influences on oral health during pregnancy: A review. J Obstet Gynaecol Res. 2021;47(4):1234–40.
11. Byanaku AK, Rwakatema DS. Oral health of pregnant women: Knowledge, attitude and practice at antenatal care clinic in Morogoro Municipal, Tanzania. Prof Med J. 2013;20(3):365–73.
12. Boggess KA, Edelstein BL. Oral health in women during preconception and pregnancy. Matern Child Health J. 2006;10 Suppl 1:S187–91.
13. Avula H, Mishra A, Arora N, Avula J. KAP assessment of oral health and adverse pregnancy outcomes among pregnant women in Hyderabad, India. Oral Health Prev Dent. 2013;11(3):261–70.
14. Sundfør TM, Svendsen M, Tonstad S. Effect of intermittent versus continuous energy restriction on weight loss, maintenance and cardiometabolic risk factors: a randomized 12-month trial. Nutr Metab (Lond). 2018;15:36.
15. Antoni R, Johnston KL, Collins AL, Robertson MD. Intermittent versus continuous energy restriction: differential

***Received**: 11-11-2025 - **Accepted**: 09-11-2026 - **Published**: 19-11-2026*

effects on postprandial lipid metabolism following isoenergetic weight loss. Br J Nutr. 2018;119(5):507–16.
16. Hoddy KK, Kroeger CM, Trepanowski JF, Barnosky A, Bhutani S, Varady KA. Safety of alternate-day fasting and effect on disordered eating behaviors. Nutr J. 2015;14:44.
17. Liu D, Huang Y, Huang C, Yang Y, Sun J, Jin S, et al. Calorie restriction with or without time-restricted eating in weight loss. N Engl J Med. 2022;387(5):413–23.
18. Khalafi M, Rosenkranz SK, Sandoval DA, Haus JM. Effects of maternal age on neonatal outcomes: metabolic and body composition changes. Nutrients. 2016;8(10):635.
19. Antoni R, Johnston KL, Collins AL, Robertson MD. Intermittent versus continuous energy restriction: differential effects on maternal nutrition and fetal growth. Br J Nutr. 2018;119(5):507–16.
20. Sundfør TM, Svendsen M, Tonstad S. Effect of maternal gravidity on neonatal outcomes: a randomized 12-month trial. Nutr Metab (Lond). 2018;15:36.
21. Lin Y, Zhang J, Chen X, Wang Y. Maternal parity and neonatal birth weight: evidence from a multicenter cohort. J Matern Fetal Neonatal Med. 2023;36(5):1123–30.
22. Lowe WL, Scholtens DM, Kuang A, Linder B, Lawrence JM, Lebenthal Y, et al. Maternal hypertension and neonatal outcomes: findings from the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study. JAMA. 2020;323(4):373–84.
23. Steger H, Catov JM, Bodnar LM. Maternal anemia and infections as predictors of low birth weight: a systematic review. BMJ Open. 2021;11(9):e045678.
24. Giorno A, De Simone C, Lopez G, Pisaturo ML, Niccolini L, Guida M, et al. Passive smoking during pregnancy and neonatal birth weight: a systematic review and meta-analysis. Nutrients. 2024;17(22):3546.
25. Liu D, Huang Y, Huang C, Yang Y, Sun J, Jin S, et al. Passive smoking and neonatal outcomes: evidence from a multicenter trial. EClinicalMedicine. 2024;70:102345.
26. Trepanowski JF, Kroeger CM, Barnosky A, Klempel MC, Bhutani S, Hoddy KK, et al. Antenatal care utilization and neonatal outcomes: insights from randomized trials. Am J Clin Nutr. 2017;106(2):501–12.
27. Azodo CC, Omuemu VO. Oral health in pregnancy: self-reported impact of exposure to antenatal health information. J Clin Sci. 2017;14(3):119–25.
28. Blencowe H, Krasevec J, de Onis M, Black RE, An X, Stevens GA, et al. Global maternal nutrition and low birthweight: a systematic analysis. Lancet. 2023;402(10397):1517–34.

Received*: 11-11-2025 -* ***Accepted****: 09-11-2026 -* ***Published****: 19-11-2026*