

The Risk Factors Affecting Low Birth Weight: An Updated Systematic Review (2020–2026)

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ARTICLE INFO	ABSTRACT
Article type: Original Article Article History: Received 22 Jul 2026 Accepted: 24 Aug 2026 Keywords: Birth weight, Low birth weight, Risk factors, Systematic review, Meta-analysis	Background: Low Birth Weight (LBW) remains a major determinant of neonatal survival and long-term health. This systematic review updates the evidence on risk factors for LBW, focusing on studies published between 2020 and 2026, with particular attention to findings from Iran and comparable international data. methods: A systematic search of observational studies was conducted in PubMed, Scopus, Web of Science, Google Scholar, Embase, Cochrane Library, Magiran, Scientific Information Database (SID), and IranDoc. Studies published from January 2020 to June 2026 were screened. Quality was assessed using STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) and Newcastle-Ottawa checklists. Results: From 1,847 screened articles, 35 met inclusion criteria (28 Iranian, 7 international). Pooled prevalence of LBW in Iran is approximately 8.0% (95% CI: 7–9%). Major risk factors with significant associations include maternal smoking, hypertension, underweight BMI, depression, anemia, periodontitis, inadequate prenatal care, food insecurity, and environmental exposures. Long-term consequences include increased risks of metabolic syndrome, glucose disorders, asthma, and cerebral palsy. Conclusions: LBW is influenced by multiple modifiable factors. Effective prevention requires integrated interventions addressing nutrition, prenatal care, mental health, smoking cessation, and chronic disease management.
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Introduction

Birth weight is a critical indicator of fetal growth and infant survival, with lasting implications for development and adult health. LBW, defined as weight below 2,500 g irrespective of gestational age, contributes substantially to neonatal morbidity and mortality worldwide (1).

Globally, LBW remains prevalent, with significant regional disparities. In Iran, the overall prevalence is estimated at approximately 8.0% (95% CI: 7–9%), with considerable provincial variation (2). Very low birth weight (VLBW) and extremely low birth weight (ELBW) are reported at 0.61% and 0.29%, respectively (2).

The consequences of LBW extend beyond infancy. Adults born with LBW face higher risks of cardiovascular-metabolic disorders, glucose metabolism abnormalities, and metabolic syndrome (3).

Twin studies also link LBW to increased asthma and cerebral palsy (4). These findings underscore LBW as a public health priority.

Several systematic reviews have previously summarized risk factors for LBW in Iran (5). More recent evidence also points to maternal age as a contributing demographic factor, with both younger and older mothers facing elevated risks (6).

The etiology of LBW is multifactorial, involving maternal lifestyle, health conditions, obstetric factors, healthcare access, and socioeconomic determinants. This systematic review synthesizes recent evidence (2020–2026) to provide an updated understanding of risk factors, with a focus on Iranian data.

Methods

Search Strategy

Following Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines, we systematically searched Persian databases (Magiran, SID,

IranDoc) and English databases (PubMed, Scopus, Web of Science, Google Scholar, Embase, Cochrane Library) for studies published between January 2020 and June 2026.

Search terms included "Low Birth Weight," "LBW," "Risk Factors," "Determinants," "Predictors," "Pregnancy Outcomes," combined with Boolean operators.

Inclusion and Exclusion Criteria

Observational studies (cross-sectional, case-control, cohort) in Persian or English were included if they examined risk factors for LBW (<2,500 g).

Case reports, reviews, animal studies, interventional studies, and articles without full-text access were excluded.

Data Extraction and Quality Assessment

Two independent reviewers screened titles, abstracts, and full texts. Extracted data included authors, year, location, study design, sample size, statistical methods, risk factors, and quality scores. Quality was assessed using STROBE and Newcastle-Ottawa scales [7]. Confidence Interval (CI) and Odds Ratio (OR) are used to necessary data analysis.

Results

From 1,847 screened articles, 35 met inclusion criteria (28 Iranian, 7 international). Pooled prevalence of LBW in Iran is approximately 8.0% (95% CI: 7–9%). Major risk factors with significant associations include maternal smoking, hypertension, underweight BMI, depression, anemia, periodontitis, inadequate prenatal care, food insecurity, and environmental exposures. Long-term consequences include increased risks of metabolic syndrome, glucose disorders, asthma, and cerebral palsy.

Table 1. Prevalence of Low Birth Weight

Region/Study	Prevalence	95% CI
Iran (overall)	8.0%	7–9% [2]
Iran – Girls	8.41%	6.7–9.2% [2]
Iran – Boys	6.67%	5.4–7.2% [2]
Iran – VLBW	0.61%	0.2–0.8% [2]
Iran – ELBW	0.29%	0.1–0.35% [2]
Developing countries	16.5%	14.8–17.2% [1]
Developed countries	~7–8%	6.4–9.2% [1]

Table 2. Major Maternal Risk Factors

1. Maternal Lifestyle Factors			
Risk Factor	Odds Ratio (OR)	95% CI	Source
Maternal smoking	2.00	1.72–2.33	[6]
Cocaine/crack use	2.82	1.70–4.67	[6]
Secondhand smoke	1.68	1.02–2.75	[7]
Alcohol consumption	1.31	1.11–1.55	[8]
2. Maternal Health Conditions			
Risk Factor	OR	95% CI	Source
Hypertension	3.90	2.39–6.36	[6]
Periodontitis	2.41	1.52–3.83	[6]
Depression	1.84	1.49–2.28	[6]
Underweight BMI	1.79	1.48–2.16	[6]
Anemia	1.59	1.06–2.39	[9]
Chronic diseases	1.18	1.01–1.39	[10]

Table 3. Obstetric and other related Factors

1.Obstetric Factors	Association	Source
Preterm delivery	P<0.001	[2]
Multiple pregnancy	P<0.001	[2]
Short birth interval (<2 years)	P<0.001	[2]
History of abortion	P<0.001	[2]
2. Socioeconomic Factors		
Low education level	P<0.001	[2]
Maternal employment	P<0.001	[2]
Household food insecurity	AOR=1.25	[7]
3. Environmental Factors		
Air pollution	Significant	[11]
Seasonal pattern	Significant	[12]

Table 4. Impact of healthcare access factor

Factor	OR	95% CI	Source
Adequate prenatal care (protective)	0.47	0.32-0.70	[6]
Adequate ANC (adjusted)	0.58	0.39-0.87	[7]

Table 5. Impact of Long-Term Consequences

Outcome	OR	95% CI	Source
Cardiovascular-metabolic disorders	1.25	1.08-1.43	[3]
Glucose metabolism disorders	1.70	1.35-2.14	[3]
Metabolic syndrome	1.75	1.34-2.27	[3]

Outcome	OR	95% CI	Source
Asthma (twins)	1.33	–	[4]
Cerebral palsy (twins)	4.88	–	[4]

Discussion

This systematic review consolidates recent evidence on LBW risk factors, drawing exclusively from studies published between 2020 and 2026. The findings reaffirm the multifactorial nature of LBW and identify priority areas for intervention.

Prevalence Patterns

The overall LBW prevalence in Iran (8.0%) is consistent with developed country levels (~7–8%) and markedly lower than the 16.5% observed in developing regions (1,2). However, the wide provincial range (4.49% to 19.1%) indicates significant internal disparities. The sex difference, with girls (8.41%) more affected than boys (6.67%), matches global biological patterns (2).

Maternal Lifestyle

Maternal smoking doubles LBW risk (OR=2.00), while secondhand smoke exposure also increases risk (OR=1.68). Cocaine/crack use shows an even stronger effect (OR=2.82). These findings highlight the need for comprehensive tobacco and substance use interventions. Alcohol consumption (OR=1.31) further supports lifestyle modification during pregnancy (8-10).

Maternal Health Conditions

Hypertension emerged as the strongest risk factor (OR=3.90), likely mediated by impaired placental perfusion. Periodontitis (OR=2.41) is notable as a treatable condition. Depression (OR=1.84) and underweight BMI (OR=1.79) emphasize the importance of mental health and nutritional status. Maternal anemia (OR=1.59) reinforces the need for iron supplementation (8,11).

Healthcare Access

Adequate prenatal care is strongly protective (OR=0.47), and this is corroborated by Iranian data showing a 42% reduction in LBW odds with sufficient antenatal care (AOR=0.58). The dose-response relationship supports strengthening prenatal care services (8-9).

Socioeconomic Determinants

Low education, maternal employment, and household food insecurity (AOR=1.25) are significant risk factors. Food insecurity likely affects LBW through nutritional, stress, and healthcare access pathways. These findings align with the growing focus on social determinants in perinatal health (9).

Environmental Factors

Air pollution and seasonal delivery patterns have emerged as significant contributors in recent Iranian studies, likely reflecting variations in nutrition, infections, and environmental exposures (12-13).

Long-Term Consequences

LBW is associated with elevated risks of cardiovascular-metabolic disorders (OR=1.25), glucose metabolism disorders (OR=1.70), and metabolic syndrome (OR=1.75) in adulthood (3). In twins, LBW increases asthma (OR=1.33) and cerebral palsy (OR=4.88) risks (4). These findings justify LBW prevention as a lifelong health investment. Our findings are consistent with prior Iranian systematic reviews (5). The role of maternal age adds another dimension to risk stratification. The long-term burden of LBW extends to growth disorders in children and may even affect maternal metabolic health in subsequent years,

reinforcing the need for lifelong follow-up (6,14-15).

Public Health Implications

- **Smoking cessation** should be prioritized given the OR=2.00 for maternal smoking (8).

- **Nutritional support** targeting underweight BMI, anemia, and food insecurity is essential (9,11).

- **Prenatal care** expansion is supported by the protective OR=0.47 (8).

- **Mental health screening** for depression (OR=1.84) (8) should be integrated.

- **Chronic disease management**, especially hypertension (OR=3.90), must begin preconception (16).

Limitations

Heterogeneity in study designs, potential publication bias, predominance of cross-sectional studies, regional data collection differences, and language restrictions should be considered.

Future Research

Prospective cohort studies, intervention trials targeting modifiable risks, mechanistic studies, and analyses of regional disparities are recommended.

Conclusion

LBW remains a significant public health issue with multiple modifiable risk factors. The strongest associations include maternal smoking (OR=2.00), hypertension (OR=3.90), underweight BMI (OR=1.79), depression (OR=1.84), anemia (OR=1.59), and periodontitis (OR=2.41). Adequate prenatal care is strongly protective (OR=0.47). Addressing these factors through integrated preconception and prenatal care, smoking cessation, nutritional support, mental health screening, and chronic disease management can substantially reduce the LBW burden. Iran's prevalence of 8.0% warrants continued investment in maternal-child health services, especially in high-prevalence regions.

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None

Conflict of Interest

None declare

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