

The Risk of Passive Smoking on Respiratory Problems and the Incidence of Low Birth Weight (LBW) in Neonates: Literature Review

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Abstract

Secondhand smoke during pregnancy is a major risk factor that can impair fetal growth and increase the incidence of respiratory disorders in newborns. Exposure occurs not only through inhalation of cigarette smoke in the air (secondhand smoke), but also through toxic residues attached to clothing, hair, skin, and surfaces belonging to smokers, known as thirdhand smoke. Exposure to harmful substances such as nicotine, carbon monoxide, tobacco-specific nitrosamines (TSNAs), and heavy metals can enter the pregnant woman's body through inhalation, skin absorption, or indirect contact, thereby triggering impaired placental perfusion, fetal hypoxia, oxidative stress, and inflammation that contribute to fetal growth restriction, low birth weight (LBW), preterm birth, and developmental disorders of the fetal respiratory system. These conditions represent a global health issue as they increase neonatal morbidity and mortality and impact children's long-term quality of life. This study aims to analyze the relationship between passive smoking exposure during pregnancy and the incidence of LBW and respiratory disorders in neonates based on recent literature. The method used was a narrative review, which involved examining various scientific articles obtained from the PubMed, ScienceDirect, and Google Scholar databases, as well as other indexed scientific journals. The literature search was conducted using keywords related to secondhand smoke, pregnancy, low birth weight, and neonatal respiratory disorders. The study findings indicate that secondhand smoke increases the risk of low birth weight, fetal growth restriction, and various neonatal respiratory disorders. Other contributing risk factors include household environmental conditions, maternal nutritional status, maternal age, body mass index, and exposure to air pollution such as PM2.5. Additionally, infants with low birth weight face a higher risk of developing respiratory distress syndrome, bronchopulmonary dysplasia, and long-term lung function impairment. Interventions such as cessation of tobacco exposure, health education, antenatal screening, and the implementation of smoke-free zones have proven to be effective preventive strategies. Secondhand smoke exposure during pregnancy is a multifactorial risk factor that contributes to low birth weight and respiratory disorders in newborns; therefore, a comprehensive preventive approach is needed to reduce its impact on the health of mothers and children.

Introduction

Exposure to cigarette smoke remains a significant public health problem in various countries, including Indonesia. Cigarette smoke contains more than 7,000 hazardous chemicals, including nicotine, tar, carbon monoxide, and various irritants that can affect the human respiratory system. Exposure to cigarette smoke not only impacts active smokers but also passive smokers who inhale cigarette smoke from their surroundings. This condition increases the risk of various health problems (Hafianty, 2026).

During pregnancy, a pregnant woman who is a passive smoker can increase the risk of health problems for her unborn child. Inhaling cigarette smoke nearby increases carbon monoxide levels fivefold and nicotine and tar levels fourfold, both of which are considered passive smokers. This can lead to premature birth. In passive smoking, CO in the body binds to hemoglobin, forming carboxyhemoglobin, which can cause fetal hypoxia, which is associated with sudden fetal death. Furthermore, CO and nicotine can also inhibit blood flow to the uterus, which can hinder protein absorption during pregnancy, which can also disrupt fetal development and cause a weak heartbeat (Choirunnisa et al., 2022).

Exposure to cigarette smoke in vulnerable groups such as pregnant women and infants is a problem that is quite difficult to avoid in developing countries like Indonesia. Cigarette smoke not only impacts the health of active smokers but also affects those who inhale it as passive smokers, causing pregnancy complications, low birth weight (LBW), and even infant death. When a pregnant woman smokes or becomes a passive smoker who inhales cigarette smoke from her partner, the chemicals in cigarettes will pass to the fetus through the placenta (Cahyani et al., 2023).

Low birth weight (LBW) is defined as a baby weighing less than 2,500 grams at birth, while according to the Ministry of Health, low birth weight (LBW) is defined as the weight between birth and the first 24 hours after birth. Low birth weight babies are more susceptible to various infectious diseases and often experience complications that result in death due to the immaturity of their organs. Contributing factors to the incidence of LBW include not only exposure to cigarette smoke but also maternal age (<20 or >35 years), short pregnancy spacing, a history of low birth weight, heavy physical work, prolonged physical work without rest, extreme poverty, underweight or malnutrition, drug use, alcohol consumption, anemia, preeclampsia or hypertension, infections during pregnancy, multiple pregnancies, babies with congenital defects, and intrauterine infections (Juriyah et al., 2023).

In addition to physiological impacts, various environmental and behavioral risk factors contribute to the high prevalence of passive smoking in pregnant women. These factors include smoking habits of family members in the home, low knowledge about the dangers of secondhand smoke, and the lack of implementation of smoke-free home policies. This condition shows that the problem of exposure to cigarette smoke is multidimensional and requires a comprehensive intervention approach, both through health education and environmental regulation (Suzuki et al., 2023).

The long-term impact of passive smoking on neonates is not limited to respiratory disorders and low birth weight (LBW), but can also increase the risk of developmental disorders and chronic diseases later in life. Several studies have shown a link between early exposure to cigarette smoke and an increased risk of asthma, decreased lung function, and cognitive impairment in children. This reinforces the urgency of preventive measures starting during pregnancy (Kurihara et al., 2023).

Based on this description, it is important to conduct a literature review to identify the relationship between passive smoking, neonatal respiratory disorders, and the incidence of low birth weight (LBW). By understanding the mechanisms and risk factors involved, it is hoped that a scientific basis can be established for developing more effective prevention strategies. This study is also expected to support promotive and preventive efforts to reduce neonatal morbidity due to passive smoking and improve the quality of maternal and child health.

Method

This study employed a narrative literature review to critically synthesize evidence concerning the relationship between passive smoking exposure during pregnancy, neonatal respiratory disorders, and low birth weight (LBW). The narrative review approach was considered appropriate because the available evidence encompassed heterogeneous study designs, populations, exposures, and clinical outcomes. Therefore, the review aimed to provide an integrative and contextual interpretation of the literature without applying a formal systematic review protocol such as PRISMA.

Relevant literature was identified through PubMed, ScienceDirect, Google Scholar, Garuda, and Neliti. The search strategy incorporated the keywords “passive smoking exposure,” “secondhand smoke,” “thirdhand smoke,” “low birth weight,” “neonatal health,” “neonatal respiratory disorders,” and “LBW,” used independently and in relevant combinations. The sources considered included national and international journal articles, textbooks, ClinicalKey papers, institutional references from the Faculty of Medicine, Universitas Muslim Indonesia, and conference proceedings published between 2016 and 2026.

Sources were included when they specifically addressed passive smoking exposure during pregnancy and its relationship with LBW, neonatal respiratory disorders, associated risk factors, diagnostic approaches, early interventions, or clinical implications. Publications outside the predetermined period and sources that did not directly address the review topic were excluded. The eligible literature was examined according to authorship and publication year, study topic or etiology, initial diagnostic approach, early intervention, relevance to emergency and intensive care settings, and publication type. The extracted evidence was subsequently organized and synthesized narratively to identify recurring findings, potential biological mechanisms, contributing risk factors, clinical implications, and preventive strategies. This synthesis formed the basis for interpreting the effects of passive smoking exposure on fetal growth and neonatal respiratory health.

Results and Discussion

The literature search and selection process identified 30 studies that met the established inclusion criteria. These studies comprised meta-analyses, literature reviews, observational studies, cohort studies, case-control studies, and conference proceedings published between 2021 and 2026. The selected evidence was synthesized to examine the relationship between passive smoking exposure during pregnancy, low birth weight, and neonatal respiratory disorders. Particular attention was given to the etiology and risk factors, initial diagnostic approaches, early interventions, and clinical relevance in emergency department and intensive care settings. A summary of the characteristics and principal contributions of the included studies is presented in the following table.

Table 1. Characteristics and Clinical Synthesis of Studies

No	Author (Year)	Topic/Etiology	Initial Diagnostics	Early Intervention	Clinical Relevance (ED/ICU)	Journal Types
1	Handriani et al., (2022)	Exposure to passive cigarette smoke in pregnant women and the risk of Low Birth Weight (LBW) through a meta-analysis	Not clinically indicated (observational study-based screening: cigarette smoke exposure & birth weight outcome <2500 g)	There are no direct interventions; the main recommendation is to reduce maternal exposure to secondhand smoke.	It is important in preventing neonatal complications such as LBW which can potentially lead to NICU admission due to prematurity and neonatal adaptation disorders.	Meta-analysis (Journal of Maternal and Child Health)
2	Septiawati & Bambang (2021)	The relationship between exposure to passive cigarette smoke, use of mosquito coils, environmental factors, and family income with LBW	Risk identification through questionnaire data collection and logistic regression analysis	Environmental health education, reducing exposure to cigarette smoke and household pollution	Relevant in cases of LBW neonates who require close monitoring in the delivery room to the NICU due to the risk of hypoxia and growth disorders.	Proceedings of the international conference on public health
3	Delcroix et al. (2023)	The impact of maternal active and passive smoking on LBW and prematurity and the effectiveness of smoking cessation policies.	Non-specific clinical diagnostic; literature review based (risk identified through epidemiological studies)	Smoking cessation interventions, tobacco control policies, prenatal education	Highly relevant in preventing prematurity and low birth weight (LBW), which often require neonatal intensive care (NICU) and respiratory stabilization in the emergency room. Relevant in preventing low birth weight (LBW), which can cause neonatal respiratory distress and	<i>Narrative review (European Publishing)</i>

					require early stabilization.	
4	Cahyani et al. (2023)	The effect of passive smoking during pregnancy on the incidence of LBW	Assessment of cigarette smoke exposure in the home and environment using a case-control approach	Family education to create a smoke-free environment	Relevant in preventing LBW which can cause neonatal respiratory distress and the need for early stabilization	<i>Observational case-control study</i>
5	Yaya & Odusina (2025)	The relationship between household second-hand smoke and LBW in Sub-Saharan Africa	DHS analysis and identification of birth weight <2500 grams	Home smoking ban policy and integration of SHS education in antenatal care	Significant in reducing neonatal morbidity and NICU admission rates due to LBW	<i>Cross-sectional study (PLOS ONE)</i>
6	Andriani et al., (2023)	Exposure to secondhand smoke in the home and LBW incidents in Indonesia	2017 IDHS survey and identification of SHS exposure history	Health promotion and domestic cigarette smoke exposure reduction policies	Important in detecting LBW risk factors related to neonatal adaptation disorders	<i>Population-based survey study</i>
7	Delcroix-Gomez et al. (2022)	The effect of active/passive smoking on fetal growth restriction (FGR), LBW, and prematurity	Examination of exhaled carbon monoxide levels ($CO \geq 3$ ppm), monitoring of birth weight and gestational age	<i>Smoking cessation from the first trimester and prenatal monitoring</i>	Very relevant for premature and low birth weight neonates who are at risk of respiratory distress and require NICU	<i>Prospective cohort study</i>
8	Muliana Edi et al. (2021)	The relationship between exposure to second-hand smoke and inadequate weight gain in pregnant women with	Assessment of SHS exposure through interviews and recording of	Maternal nutrition education and SHS avoidance at home	Important in preventing LBW which is associated with neonatal morbidity and	<i>Cross-sectional study</i>

		LBW	infant birth weight		respiratory distress	
9	Parasin, et al. (2024)	Exposure to PM2.5 during pregnancy and the risk of low birth weight (LBW)	Identification of PM2.5 exposure and evaluation of birth weight outcomes	Reducing exposure to air pollution during pregnancy	Relevant to the prevention of fetal growth disorders and neonatal complications due to LBW	<i>Systematic review & meta-analysis</i>
10	Moreira et al. (2024)	Prevalence of bronchopulmonary dysplasia (BPD) in neonates with very low birth weight	Diagnosis of BPD through oxygen/ventilation requirements at 28 days or 36 weeks postmenstrual age	Intensive respiratory monitoring and supportive neonatal management	Highly relevant in the NICU as BPD is a major complication in preterm and VLBW neonates.	<i>Systematic review & meta-analysis</i>
11.	Lou et al., (2025)	Genetic interaction of PAX9 rs2073244 and passive smoking exposure during pregnancy on the incidence of low birth weight babies (LBW).	Identification of PAX9 rs2073244 genotype and history of passive cigarette smoke exposure in pregnant women	Education on avoiding exposure to cigarette smoke, especially for mothers with genetic risk factors.	Relevant for early detection of LBW risk factors that can increase the need for neonatal observation and NICU	<i>Case-control study</i>
12.	Levy et al., (2021)	The relationship between passive smoking during pregnancy and neonatal outcomes and placental histopathology	Evaluation of passive cigarette smoke exposure, examination of delivery outcomes and placental histopathology	Maternal counseling to avoid exposure to cigarette smoke during pregnancy	Highly relevant in cases of fetal growth restriction (FGR), fetal distress, and increased NICU admissions	<i>Prospective case-control study</i>
13.	Adair et al. (2021)	The relationship between very low birth weight (VLBW) and pulmonary hypertension and lung function (PFT)	Pulmonary function tests (Rrs, Crs) and diagnosis of pulmonary hypertension through estimation of pulmonary/right ventricular	Neonatal respiratory monitoring and pulmonary hypertension screening in VLBW infants	Particularly relevant in the NICU because pulmonary hypertension increases the need for mechanical ventilation and the risk of	<i>Pilot study (Journal of Pediatrics)</i>

			pressure		respiratory failure.	
14.	Haikerwal et al. (2021)	The impact of exposure to forest fire smoke on respiratory disorders in young adults born very prematurely/E LBW	Evaluation of lung function (FEV1) and self-reported respiratory outcomes after smoke exposure	Smoke pollution avoidance education and long-term monitoring in high-risk individuals	Relevant to patients with a history of prematurity/EL BW who are at high risk of respiratory distress and possible ED visits	<i>Cohort follow-up study (Environmental Research)</i>
15.	Hong-Kun Di et al. (2022)	The relationship between maternal smoking during pregnancy and the risk of low birth weight (LBW) in neonates	Identification of smoking habits of pregnant women and birth weight outcomes (<2500 g) through cohort data	<i>Smoking cessation and antenatal education to reduce nicotine exposure</i>	Relevant to LBW neonates with risk of respiratory distress and need for NICU care	<i>Systematic review & meta-analysis (World Journal of Pediatrics)</i>
16.	Tai-Ho Hung et al. (2023)	Exposure to air pollution (NO ₂ and PM2.5) during pregnancy on LBW and preterm birth	Measurement of air pollutant exposure (NO ₂ , PM2.5) and analysis of birth outcomes	Reducing exposure to air pollution and environmental interventions during pregnancy	Relevant in cases of LBW and prematurity who are at risk of NICU admission due to neonatal respiratory disorders	<i>Systematic review & meta-analysis (Environmental Science and Pollution Research)</i>
17	Sri Ramadhani Fitri (2025)	The relationship between a history of passive smoking and weight gain in pregnant women with the incidence of low birth weight (LBW)	Identify history of exposure to passive cigarette smoke, measure pregnant mother's weight, and baby's birth weight	Health education regarding the dangers of exposure to passive cigarette smoke and monitoring weight gain in pregnant women	Relevant in preventing LBW which has the risk of causing impaired neonatal adaptation and the need for NICU	<i>Cross-sectional analytic study</i>
18	Kurihara, Kuniyoshi, & Rehan (2023)	Prenatal exposure to cigarettes/nicotine, preterm birth, and long-term impacts on lung function	Non-specific (literature review; focus on identifying risk based on prenatal exposure history and	Primary prevention includes stopping exposure to cigarettes/nicotine during pregnancy,	Relevant to neonatal ICU and long-term respiratory follow-up due to increased risk of asthma, chronic lung	<i>Review (Narrative Review)</i>

		and asthma risk	long-term respiratory outcomes such as asthma)	prenatal education, and controlling maternal risk factors.	disorders, and respiratory complications due to prematurity	
19	Xiaokai Wang et al. (2024)	The impact of active and passive smoking on pregnancy outcomes including low birth weight (LBW)	Data collection through questionnaires and follow-up of pregnancy outcomes	<i>Smoking cessation, antenatal education, and avoidance of exposure to cigarette smoke</i>	Relevant in cases of LBW, prematurity, and IUGR that potentially require NICU care	<i>Cohort study</i>
20	Wariyaka et al. (2026)	Respiratory health risks due to exposure to second-hand smoke (SHS) in pregnant women and its impact on pregnancy outcomes	Identification of SHS exposure in households, evaluation of maternal respiratory disorders and pregnancy outcomes	Family education about the dangers of SHS, reducing exposure to cigarette smoke at home	Relevant to the prevention of maternal respiratory disorders, prematurity, LBW, and neonatal complications requiring NICU	<i>Literature review</i>
21	Jenkinson et al. (2023)	The effect of exposure to second-hand smoke during pregnancy on infant respiratory control	Ventilatory response examination for hypercapnia using added dead space breathing	Reducing exposure to cigarette smoke during pregnancy and monitoring neonatal respiration	Relevant to the risk of neonatal respiratory control disorders and sudden infant death syndrome (SIDS) requiring intensive neonatal observation	<i>Experimental clinical study (European Journal of Pediatrics)</i>
22	Kusumawar dhani et al., (2025)	Factors associated with respiratory distress syndrome (RDS) in neonates	Evaluation of gestational age, birth weight, maternal complications, and diagnosis of RDS	Close monitoring of high-risk neonates, especially LBW and premature neonates	Very relevant in the NICU as low birth weight is a dominant factor in neonatal RDS.	<i>Case-control study</i>
23	Yeh et al., (2022)	<i>Thirdhand smoke (THS) is a source of toxic exposure in the indoor environment through cigarette smoke residue that sticks to</i>	Exposure identification is conducted through indoor environmental evaluation and chemical exposure models; it is not a direct	Prevention includes eliminating sources of exposure, decontamination of the home environment, limiting contact of pregnant	Relevant for preventing neonatal respiratory distress and complications due to chronic prenatal exposure, including	<i>Article Review / Narrative Review</i>

		<i>clothes, hair, skin, furniture and house dust.</i>	clinical diagnosis in pregnant women/neonates.	women with cigarette smoke residue on the body/surface of objects.	pulmonary inflammation and fetal growth disorders that may increase the need for NICU observation.	
24	Agustin et al., (2021)	The relationship between exposure to cigarette smoke in pregnant women and the baby's birth weight	Identification of cigarette smoke exposure and measurement of infant birth weight	Family health education regarding the impact of cigarette smoke on the fetus	Relevant in preventing LBW and neonatal complications related to respiratory disorders	<i>Cross-sectional analytic study</i>
25	Günther et al., (2021)	The effect of nicotine and maternal BMI on fetal birth weight	Assessment of maternal BMI status and smoking habits during pregnancy and evaluation of infant birth weight	<i>Smoking cessation and monitoring of nutritional status/BMI of pregnant women</i>	Relevant to the prevention of LBW which increases the risk of neonatal complications and the need for NICU	<i>Retrospective cohort study (BMC Pregnancy and Childbirth)</i>
26	Kusumaningtyas & Yusuf Ryadi (2022)	The effect of exposure to cigarette smoke on pregnant women as passive smokers on the incidence of low birth weight babies	Identification of cigarette smoke exposure and low birth weight outcomes through meta-analysis	Education on avoiding exposure to cigarette smoke during pregnancy	Relevant to reducing the risk of LBW and neonatal respiratory complications	<i>Meta-analysis study (Journal of Epidemiology and Public Health)</i>
27	Akhter et al. (2024)	The impact of passive smoking on low birth weight and preterm birth in mothers giving birth	Identification of passive cigarette smoke exposure through interviews and evaluation of the baby's birth weight.	Education on cessation of exposure to cigarette smoke and monitoring of maternal risk factors	Relevant to increased risk of LBW and preterm birth requiring NICU care	<i>Case-control study (Pakistan Journal of Health Sciences)</i>
28	Hashimoto et al. (2023)	Tobacco exposure during pregnancy and the risk of infection in infants <1 year	Assessment of active/passive cigarette exposure status and monitoring of neonatal infection	Prevention of exposure to cigarette smoke during pregnancy and family education	Relevant to increased risk of lower respiratory tract infections, otitis media, and	<i>Prospective cohort study (Journal of Epidemiology)</i>

		of age	events		neonatal/pediatric hospitalizations	
29	Yasmeen et al., (2022)	The effect of passive smoking on neonatal birth weight	Assessment of history of exposure to cigarette smoke and measurement of baby's birth weight	Smoke-free environment education during pregnancy	Relevant to the prevention of LBW and neonatal respiratory complications	<i>Cross-sectional study (Pakistan Journal of Medical & Health Sciences)</i>
30	Arif et al., (2024)	Assessment of exposure to passive cigarette smoke in pregnant women	SHS exposure questionnaire at home, work and public spaces	Promotion of smoke-free policies and maternal health education	Relevant in screening prenatal risk factors that impact neonatal morbidity	<i>Cross-sectional study (Biological and Clinical Sciences Research Journal)</i>

Overview and Impact of Secondhand Smoke on Neonates

Secondhand smoke (SHS) during pregnancy is a significant risk factor affecting fetal and neonatal health. A synthesis of various articles indicates that pregnant women exposed to secondhand smoke have a higher risk of low birth weight (LBW), prematurity, and neonatal respiratory distress. Cigarette smoke contains nicotine, carbon monoxide, and various other toxic substances that can reduce oxygen supply to the fetus through vasoconstriction of placental blood vessels (Delcroix et al., 2023;

Secondhand smoke originates from the home, partner, workplace, and public spaces. Research by Andriani H et al. (2023) showed that exposure to SHS in the home is very high in pregnant women and is significantly associated with the incidence of low birth weight (LBW). Similarly, Yaya S et al. (2025) found that household SHS exposure increases the risk of low birth weight (LBW) in Sub-Saharan African countries. 16 Furthermore, Levy M et al. (2021) found that secondhand smoke during pregnancy is associated with fetal vascular malperfusion in the placenta, which leads to impaired fetal growth and increased NICU admissions.

Respiratory disorders in neonates are also a significant impact of secondhand smoke during pregnancy. Intrauterine nicotine exposure can disrupt fetal lung development, increasing the risk of respiratory distress syndrome (RDS), bronchopulmonary dysplasia (BPD), and long-term lung function impairment (Agustin et al., 2021; Moreira et al., 2024). Jenkinson A et al. (2023) also stated that secondhand smoke during pregnancy causes impaired ventilatory response in neonates, which can increase the risk of respiratory disorders after birth.

Pathophysiology of Secondhand Smoking in Neonates

Secondhand smoking occurs through direct inhalation of cigarette smoke in the air (secondhand smoke/SHS). Inhaling secondhand smoke from nearby cigarettes increases the levels of carbon monoxide fivefold and nicotine and tar fourfold in the body (Juriyah et al., 2023). It can also occur through exposure to toxic cigarette residues that linger on the smoker's body and environment, known as thirdhand smoke (THS). Thirdhand smoke is cigarette smoke residue that remains on clothing, hair, skin, hands, furniture, bedding, vehicles, and house dust after

smoking has ended. As a result, pregnant women can still be exposed even if they are not near the smoker or do not directly see the cigarette smoke. Yeh et al. (2022) explained that THS exposure occurs through inhalation of particles that are released back into the air (re-emission), absorption through the skin upon contact with contaminated surfaces, and indirect ingestion through hands or objects exposed to cigarette residue (Hashimoto et al., 2023; Di et al., 2022). Thus, family members who smoke can indirectly cause pregnant women to become passive smokers through toxic particles carried on body surfaces and clothing. Research by Hang et al. (2017) explains that THS has been shown to cause DNA damage, oxidative stress, inflammation, and toxic effects in cell cultures and experimental animals, but human epidemiological data is still limited, so it cannot be stated that the risk is 2-, 3-, or 5-fold higher.

Pathophysiologically, residual nicotine, carbon monoxide, tobacco-specific nitrosamines (TSNAs), polycyclic aromatic hydrocarbons (PAHs), formaldehyde, and heavy metals entering the body of pregnant women can affect placental function and fetal growth. Nicotine causes vasoconstriction of uteroplacental blood vessels, thereby reducing blood perfusion and oxygen supply to the fetus, while carbon monoxide increases the formation of carboxyhemoglobin, which reduces oxygen-carrying capacity. These conditions lead to chronic intrauterine hypoxia, fetal growth restriction (FGR), prematurity, and low birth weight (LBW). Furthermore, oxidative stress and systemic inflammation due to exposure to cigarette toxins can cause placental vascular dysfunction and fetal vascular malperfusion, contributing to an increased risk of neonatal complications (Levy et al., 2021; Delcroix-Gomez et al., 2022; Hashimoto et al., 2023).

Prenatal nicotine exposure also impacts the development of the fetal respiratory system. Impaired alveolar differentiation, impaired lung maturation, and altered inflammatory regulation make neonates more susceptible to respiratory distress syndrome (RDS), bronchopulmonary dysplasia (BPD), impaired ventilatory response, and chronic lung disease in childhood and adulthood. Jenkinson et al. (2023) reported that exposure to cigarette smoke during pregnancy can impair the neonatal ventilatory response, while Kurihara et al. (2023) explained that prenatal nicotine exposure increases the risk of long-term lung disorders. Preventing cigarette smoke exposure in pregnant women is not enough just by prohibiting smoking in the home, but also requires education about the dangers of thirdhand smoke, including the importance of changing clothes, washing hands, and maintaining a home environment free of cigarette smoke residue (Kurihara et al., 2023).

Risk Factors for Passive Smoking and Low Birth Weight in Neonates

Based on the results of the article synthesis, risk factors can be grouped into environmental, maternal, behavioral, and biological/genetic factors.

Environmental Factors

Exposure to secondhand smoke at home is a dominant factor increasing the risk of low birth weight and neonatal respiratory disorders. Husbands or family members who smoke are the main source of low birth weight in pregnant women. In addition, air pollution such as PM_{2.5} and NO₂ also increases the risk of low birth weight due to impaired fetal growth. Septiawati D et al. (2021) also found that proximity to industrial areas and the use of mosquito coils also increase the risk of low birth weight.

Maternal Factors

Maternal age >30 years, poor nutritional status, inadequate weight gain during pregnancy, and an abnormal BMI increase the risk of low birth weight. Research by Edi M et al. (2021)

showed that mothers with inadequate gestational weight gain had almost twice the risk of giving birth to LBW babies (di et al., 2021). In addition, multiparity and young or too old maternal age also contributed to poor neonatal outcomes (Fitri., 2025).

Behavioral and Social Factors

Active smoking behavior and environmental exposure to secondhand smoke significantly influence neonatal outcomes. Low education and a lack of family awareness of the dangers of secondhand smoke contribute to high levels of exposure during pregnancy (Septiawati & Wispriyono., 2021; Yasmeen et al., 2022). Wang X et al. (2024) also reported that mothers with low levels of education are more exposed to secondhand smoke and have a higher risk of preterm birth and low birth weight (LBW).

Biological and Genetic Factors

Several studies have shown an interaction between genetic factors and secondhand smoke exposure. Lou Q et al. (2025) found that the AG/AA genotype in PAX9 rs2073244 increases susceptibility to low birth weight (LBW) in mothers exposed to secondhand smoke. Additionally, Delcroix MH et al. (2022) explained that exposure to both active and passive cigarette smoke can increase the risk of fetal growth restriction (FGR) through impaired placental oxygenation and perfusion.

Early Diagnostic Strategies for Respiratory Disorders and Low Birth Weight Neonatal Birth

Initial diagnosis of neonates at risk from cigarette smoke exposure is made through assessment of birth weight, gestational age, respiratory examination, and pulmonary function evaluation. Infants with a birth weight <2500 grams are categorized as low birth weight (LBW) and require close monitoring due to the risk of respiratory disorders and other neonatal complications (Handriani et al., 2022).

Neonatal pulmonary and respiratory function assessments are especially important in very low birth weight (VLBW) infants. Adair JD et al. (2021) showed that VLBW infants with pulmonary hypertension have increased airway resistance and decreased lung compliance. In addition, Moreira A et al. (2024) reported that the prevalence of bronchopulmonary dysplasia (BPD) is quite high in infants with very low birth weight and low gestational age.

Other supporting examinations such as blood gas analysis, pulse oximetry, and chest radiology are also important in neonates with signs of respiratory distress syndrome (RDS) or bronchopulmonary dysplasia (BPD). Kusumawardhani et al. (2025) showed that low birth weight is the dominant factor associated with the occurrence of RDS in neonates. Therefore, early screening is crucial, especially in premature and low birth weight infants who are at high risk of requiring neonatal intensive care.

Interventions and Prevention Strategies

Cessation of Cigarette Smoke Exposure

Most studies show that cessation of cigarette smoke exposure during pregnancy can reduce the risk of low birth weight (LBW) and neonatal respiratory disorders. Delcroix et al. (2022) stated that smoking cessation in the first and second trimesters significantly reduces the risk of fetal growth restriction and prematurity. Similarly, Delcroix et al. (2023) reported that smoking cessation during pregnancy can improve infant birth weight and reduce the risk of neonatal complications (Delcroix et al., 2023).

Environmental Interventions and Health Policies

Smoke-free environmental policies in the home, workplace, and public spaces are crucial in protecting pregnant women from SHS. Delcroix et al. (2023) confirmed that tobacco control policies are effective in reducing smoking exposure during pregnancy and improving neonatal outcomes. Arif et al. (2024) also emphasized the need for public health campaigns and smoke-free policies to protect pregnant women from SHS exposure.

Health Education and Promotion

Educating pregnant women and their families about the effects of secondhand smoke on the fetus is a key preventive strategy. Fitri (2025) demonstrated that health promotion regarding the dangers of secondhand smoke can help reduce the risk of low birth weight (LBW). Wariyaka et al. (2026) also stated that health interventions need to target all family members, especially husbands as the primary source of SHS exposure at home.

Pregnancy and Nutrition Monitoring

Monitoring maternal weight gain during pregnancy and meeting adequate nutritional needs can help prevent LBW. Edi et al. (2021) showed that inadequate weight gain during pregnancy increases the risk of LBW. Furthermore, Günther et al. (2021) stated that the combination of abnormal maternal BMI and smoking habits worsens pregnancy outcomes, making maternal nutritional monitoring crucial.

Clinical Implications for Healthcare

Passive smoking during pregnancy has a significant impact on neonatal health, particularly on the respiratory system and fetal growth. LBW and prematurity increase the risk of respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary hypertension, as well as the need for mechanical ventilation and NICU care. Research by Levy M et al. (2021) also showed that neonates of mothers exposed to SHS have an increased rate of NICU admissions due to growth retardation and respiratory problems.

Neonatal respiratory problems due to SHS exposure can progress to chronic lung problems that persist into adulthood. Haikerwal et al. (2021) showed that individuals born extremely preterm or with extremely low birth weight have a higher risk of respiratory disorders in adulthood, especially after exposure to smoke pollution such as wildfire smoke. Kurihara et al. (2023) also explained that nicotine exposure during the prenatal period can increase the risk of chronic lung disease and asthma in childhood and adulthood.

In the emergency department (ED) and intensive care unit (ICU), neonates with a history of intrauterine cigarette smoke exposure require close observation for respiratory distress, oxygen saturation, and signs of respiratory failure. Therefore, early detection, family education, and prevention of cigarette smoke exposure during pregnancy are important steps in reducing neonatal morbidity and mortality.

Conclusion

This literature review shows that passive smoking during pregnancy is significantly associated with low birth weight (LBW), impaired fetal growth, premature birth, and various respiratory problems in neonates. Pregnant women exposed to secondhand smoke (SHS) have a higher risk of low birth weight (LBW), impaired lung function, respiratory distress syndrome (RDS), and an increased risk of respiratory disorders in infancy and childhood. Passive smoking not only affects intrauterine growth but also impacts the development of the fetal respiratory system through hypoxia, impaired placental oxygen supply, increased carbon monoxide levels, and inflammation caused by cigarette toxins. Other factors such as maternal nutritional status, body mass index, maternal age, and exposure to air pollution such as PM_{2.5} contribute to the

risk of low birth weight (LBW) and neonatal respiratory complications. Low birth weight (LBW) babies are also more susceptible to chronic lung disorders, bronchopulmonary dysplasia (BPD), pulmonary hypertension, and impaired lung function into young adulthood. Therefore, preventing exposure to cigarette smoke during pregnancy is a crucial step in reducing neonatal morbidity and mortality. Effective prevention strategies include health education for families, implementing smoke-free areas at home, raising awareness about the dangers of SHS, routine screening during antenatal care, and family- and community-based promotive and preventive interventions. With a comprehensive and sustainable approach, the risk of respiratory disorders and low birth weight (LBW) due to passive smoking in neonates can be significantly reduced.

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