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METHODS OF EARLY DETECTION FOR LOW BIRTH WEIGHT (LBW) BABIES: A SCOPING REVIEW

Metode Deteksi Dini Berat Badan Lahir Rendah (BBLR): Scoping Review

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ABSTRAK

Berat Badan Lahir Rendah (BBLR) merupakan penyebab kematian neonatal terbanyak di Indonesia pada tahun 2022 dengan proporsi 28,2%. Salah satu upaya pencegahan yaitu dengan melakukan upaya deteksi dini. Tujuan review untuk mengidentifikasi keragaman dan keefektifan metode deteksi dini BBLR, yang dapat membantu penyedia layanan kesehatan, termasuk bidan, dalam membuat keputusan klinis yang tepat untuk mencegah komplikasi seperti kematian neonatal dan infeksi. Scoping review menggunakan framework Prisma Sc-R. Pencarian dari beberapa database seperti PubMed, Sience Direct, Wiley Online Library, EBSCO dan Google Scholar dilakukan pada tahun 2018-2023, free full text, dengan kata pencarian ((((Method) OR (Techniques)) AND ("Early Detection")) OR (Predict*)) AND ("Low Birth Weight") dan artikel yang dipilih dilakukan Critical Appraisal menggunakan ceklist Joanna Briggs Institute dan Mixed Methods Appraisal Tool (MMAT). Didapatkan 7 artikel yang telah diseleksi dari 1114 artikel berdasarkan kriteria inklusi dan eksklusi. Artikel berasal dari 4 negara berbeda. 7 artikel yang relevan menggunakan desain penelitian cross-sectional, cohort dan mix methods study. Terdapat dua tema yaitu metode deteksi dini BBLR periode pra-konsepsi dan periode antenatal. Metode deteksi dini BBLR periode pra-konsepsi menggunakan risk score berdasarkan karakteristik ibu sedangkan metode deteksi dini BBLR periode antenatal dapat menggunakan berat badan kehamilan trimester III, nomogram untuk BBLR dan antenatal risk scoring scale. Metode deteksi dini BBLR ini dapat membantu dalam mengidentifikasi wanita hamil yang memiliki resiko lebih tinggi dalam melahirkan bayi BBLR sehingga dapat diberikan intervensi yang tepat.*

Kata kunci: *berat badan lahir rendah, deteksi dini, scoping review*

ABSTRACT

In Indonesia, LBW is the primary cause of newborn mortality in 2022 with proportion of 28.2%. One of the prevention efforts is to conduct early detection efforts. The aim was to identify the diversity and effectiveness of early detection methods for LBW, which can assist healthcare providers, including midwives, in making informed and prompt clinical decisions to prevent complications such as neonatal mortality and infections. Scoping review using the Prisma Sc-R framework. Searches from several databases such as PubMed, Science Direct, Wiley Online Library, EBSCO and Google Scholar were conducted in 2018-2023, free full text, with search words *((((Method*) OR (Techniques)) AND ("Early Detection")) OR (Predict*)) AND ("Low Birth Weight")* and the Joanna Briggs Institute checklist and Mixed Methods Appraisal Tool (MMAT) were used to conduct a critical appraisal of a few chosen articles. Based on inclusion and exclusion criteria, the articles originate from 4 different countries, 7 articles were chosen out of 1114 articles. The 7 relevant articles used cross-sectional, cohort and mix methods study research designs. There are two themes, namely early detection methods of LBW in the pre-conception period

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and antenatal period. In the pre-conception period method uses a risk score based on maternal characteristics while the antenatal period can use third-trimester pregnancy weight, nomogram for LBW and antenatal risk scoring scale. This early detection of LBW can identify pregnant women who are more likely to give birth to LBW babies.

Keywords: early detection, low birth weight scoping review

INTRODUCTION

Every year, more than 20 million newborns are born underweight (LBW) (<2500g) throughout the world [1]. Europe has the lowest frequency of low birth weight (LBW) (6.4%), while Central and South Asia has the highest rate (27.1%). Twenty million LBW are born each year, or 15.5% of all LBW babies worldwide. In low-income countries, about one in six children are born with low birth weight (16.5%), more than double that in high-income countries (7%) [1]. The most common causes of neonatal death in Indonesia in 2022 are low birth weight (LBW) (28.2%) and asphyxia (25.3%) [2].

Possible short-term complications include neonatal and post-neonatal mortality caused by respiratory complications, infections, growth problems, and developmental delays. In adulthood, LBW may also increase the risk of low intellectual disability and non-communicable diseases such as diabetes and coronary heart disease [3]. The high MMR and IMR and the slow decline in both rates indicate the need for improvements in maternal and child health services. Improvements need to be made not only in terms of service coverage but also in the quality of services provided by health workers [4].

A research review by Novitasari (2020) [5] explained that the estimated prevalence of LBW (<2500 grams) in Indonesia is 15.5%. In Indonesia, LBW can be prevented and controlled through the use of the following strategies: health education, monitoring and supervision, preventing infant hypothermia, providing free therapies, assessing pregnant women's nutritional status, and planning and preparing steps in health protocol. Another review by [6] revealed that 95.6% of births in underdeveloped nations result in low birth weight (LBW) and that LBW is one of the factors contributing to infant mortality (IMR) in Indonesia. Anemia in pregnancy is a cause of LBW births. LBW births from mothers with anemia during pregnancy were 92.3%. The causes of anemia are iron deficiency (46.1%), an education level (7.6%), low economic status (7.6%), and nutrition (7.6%).

Despite the significant body of research on LBW, studies specifically examining the variety and effectiveness of early detection methods remain limited. This study focuses on the population of pregnant women, exploring early detection methods for low birth weight in the context of LBW at a global level. Reviewing this topic is important as it is directly related to maternal and infant health. LBW is a serious societal issue that can lead to the risk of neonatal mortality and long-term effects. By evaluating early detection methods of LBW, this study provides in-depth insight into risk factors, effective detection methods, and appropriate intervention strategies. The findings from this review support healthcare workers in making clinical decisions, driving health technology development, and improving prevention and treatment for better health outcomes for mothers and babies. Overall, this review plays an important role in improving the understanding and management of LBW and enhancing the role of midwives and other health workers.

METHODS

The Prisma Sc-R framework is being used in this scoping review study, which is a knowledge synthesis method that uses a systematic approach to identify and map the extent, range, and nature to determine possible gaps in literature topics [7].

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EQUATOR (*Enhancing the Quality Transparency of Health Research)* standards were followed in the development of the 22 evaluation items that make up the Sc-R framework [8].

This study aims to identify the diversity and effectiveness of early detection methods for low birth weight (LBW) by categorizing literature on the topic of early detection methods for LBW. In developing the scoping review questions, the PCC (Population, Concept and Context) frameworkwas used, namely (1) Population: pregnant women, (2) Concept: early detection methods for low birth weight, (3) Context: LBW, global.

Identification of relevant studies was carried out using several databases and search engines. The databases used were *PubMed, Science Direct, Wiley Online Library, EBSCO* and *Google Scholar. The* criteria for articles to be searched and used as sources is to identify relevant articles using inclusion and exclusion criteria. This scoping review began in December 2023, with the identification phase completed by January 2024. The inclusion criteria are: (1) Articles that discuss early detection methods of LBW, (2) Population of pregnant women, (3) Articles from 2018-2023, and (4) English. The exclusion criteria were as follows: (1) Abstract only, (2) Paid article, and (3) Article review.

The next step is to enter keywords that match the topic: *((((Method*) OR (Techniques)) AND ("Early Detection")) OR (Predict*)) AND ("Low Birth Weight")*. The search was conducted concerning the synonyms of medical subjects (MeSH) keyword method with MeSH Unique ID: Q000379 obtained technique, procedures, and methodology. The articles screening process involves several steps: (1) eliminating duplicate articles, (2) conducting an initial review based on titles and abstracts, and (3) assessing eligibility by thoroughly reading the full text [9]. This process was supported by using the Covidence website (https://www.covidence.org/). The stages of literature identification using the PRISMA Flowchart are in Figure 1.

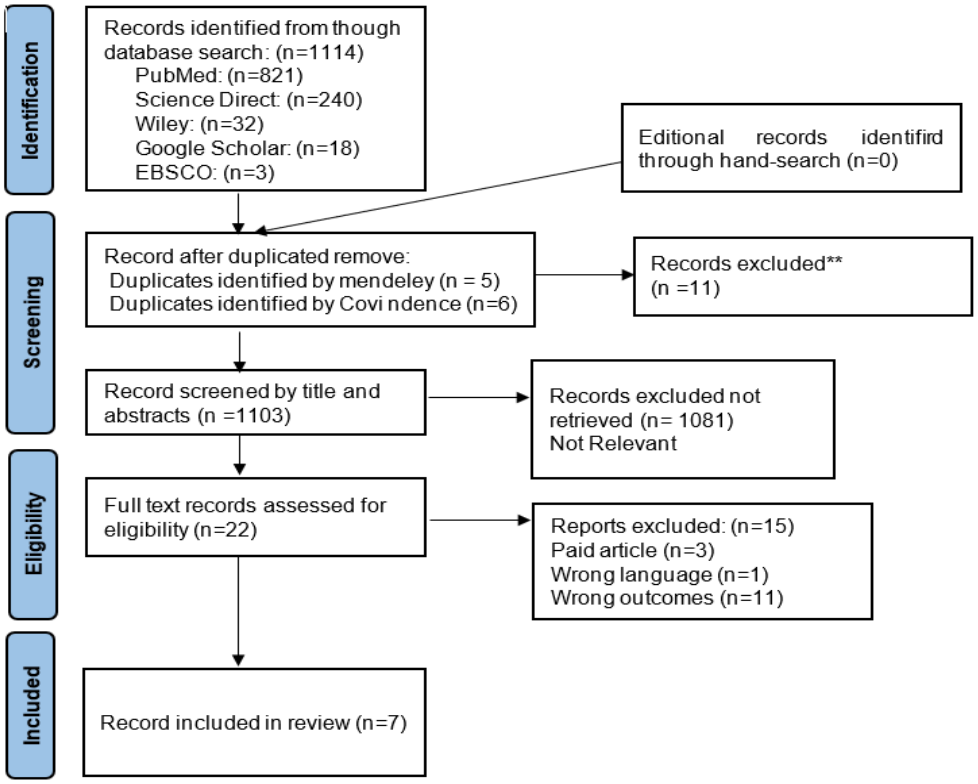

Figure 1. PRISMA-ScR Flow Diagram [11]

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From the results of searching for articles in 4 databases and 1 search engine used (*PubMed, Science Direct, Wiley Online Library, EBSCO* and *Google Scholar*) 1114 articles were found, then11 duplicate articles were obtained, and after reading the article, 7 articles were obtained in this scoping review study. The synthesis of results followed a narrative approach to identify and summarize key findings, guided by the Joanna Briggs Institute (JBI) framework for scoping reviews. This process ensures a systematic and rigorous examination of evidence [10].

RESULTS

The articles that have been selected are given ID numbers A1-A7, and then entered in a table which includes: the article title, author, country, research objectives, type of research, data collection techniques, number of respondents, and research results. The charting data is described in Table 1.

In this literature review, criteria were applied to evaluate the chosen article's quality. For cross-sectional studies, the JBI critical appraisal checklist for cross-sectional studies was the tool utilized [12]. The articles, A1 and A2, had excellent article quality but did not describe the identification of confounding factors and strategies for dealing with them. For articles with a cohort study design, the JBI critical appraisal checklist for cohort studies was used to evaluate the quality. The articles were A3, A5 and A6 with very good article quality, while article A4 did not have any explanation regarding follow-up in the study and strategies for addressing the follow-up. For article A7 mixed methods studies, the Mixed Methods Appraisal Tool (MMAT) Version 2018 was used to evaluate the quality of the article, A7 article had excellent article quality [13].

Table 1. Data Charting

No ID	Title, Country, Author, Year	Objective	Design and Method	Result
A1	An Effective Method to Predict Low Birth Weight in Indonesia Rural Area Indonesia 2021 [14]	To determine the weight limit of pregnant women in the last trimester to predict and prevent low birth weight outcomes in the community	A quantitative: cross-sectional study, the participants of this study were pregnant women who visited the health center in 2019 150 people as a sample. The sampling technique used was purposive sampling.	Data were collected from Kanjilo Health Center medical reports: maternal age, antenatal visits, maternal weight in the middle trimester of pregnancy, and infant birth weight. The cut-off point for pregnancy weight in the third trimester is 60.5 kg. Pregnant mothers with pregnancy weight in the third trimester <60.5 kg are at risk of giving birth to a LBW baby. This method was conducted in a rural setting.
A2	Prediction of Low Birth Weight Based on Maternal Third Trimester Weight Among Mothers at A Maternal Clinic in Jakarta, Indonesia	To determine whether early pregnancy weight in the third trimester can predict the incidence of LBW in newborns.	A quantitative: cross-sectional study, the participants of this study were the health records of every mother who received antenatal care and gave birth at Anny Rahardjo Maternity Clinic in 2017-2018 who had	This study used secondary data obtained from the registration of Anny Rahardjo Maternity Clinic. In the third trimester, 59.8 kg is the threshold for pregnancy weight. Moms who weigh less than 59.8 kg during the third trimester of their pregnancy are at risk of giving birth to a baby who is born before a term. This technique was applied in medical facilities.

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	Indonesia 2021 [15]		complete data on initial weight in the third trimester and birth weight. 278 moms meet the criteria and was selected as a subject research. The sampling technique used was total sampling.	
A3	Development and validation of a nomogram for predicting low birth weight among pregnant women who had antenatal care visits at Debre Markos Comprehensive and Specialized Hospital, Ethiopia Ethiopia 2023 [16]	To develop and validate a nomogram for predicting low birth weight in Ethiopia.	A quantitative: retrospective cohort study, the participants of this study were 1120 pregnant women. Client charts were selected using a simple random sampling technique	Data were extracted using a structured checklist prepared in KoboToolbox (Cambridge, Massachusetts, USA). Nomograms are made to make it easier for health workers to evaluate pregnant women at risk of LBW based on the score and provide appropriate interventions. The nomogram includes gestational age <20 years, haemoglobin <11 gr/dl, primigravida, unplanned pregnancy, and preeclampsia. This model was found to have clinical benefits.
A4	Development and Validation of a Risk Score to Predict Low Birthweight Using Characteristics of the Mother: Analysis from BUNMAP Cohort in Ethiopia Ethiopia 2020 [17]	To develop a prediction model and risk score to predict low birth weight using maternal characteristics during pregnancy	A quantitative: cohort study, the participants of this study were all pregnant women who were enrolled in the cohort and met the eligibility criteria were included in the analysis. The sampling technique used was total sampling.	This study uses data from the Butajira Nutrition, Mental health and Pregnant (BUNMAP) project in Ethiopia. Prediction and score for LBW risk are age at pregnancy (<20) with score 2.5, BMI (<18.5) with score 2.5, maternal height (<155 cm) with score 2, haemoglobin (<11.0 gr/dl) with a score of 2, primigravida with a score of 1 and comorbidities with a core of 2.5. in general, this study shows the likelihood of predicting low birth weight using maternal characteristics during pregnancy
A5	Antenatal Risk Scoring Scale for Predication	To develop an antenatal risk scoring scale	A quantitative: cohort study, the participants of this	Routinely available information was systematically collected from a cohort of 1876 mothers

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	of Low Birth Weight and Its Validity India 2019 [18]	for LBW prediction	study were 380 pregnant women who were randomly selected. Pregnant women who planned their delivery at Krishna Hospital	using a structured interview schedule. The LBW risk prediction score is eating <4 score 12, working hard score 3, night sleep <6 hours score 3, illiteracy score 2, antenatal morbidity score 1, weight gain <10) kg score 1, maternal weight <40 kg score 1, anemia in the first-trimester score 1.
A6	A Model to Predict Low Birth Weight Infants and Affecting Factors Using Data Mining Techniques Iran 2018 [19]	To find the right predictor factors for LBW in infants using data mining.	A quantitative: retrospective cohort study, the sample in this study was 450 pregnant women obtained from medical records. The sampling technique used was purposive sampling.	Data were collected from medical records of newborns from April 2015 to April 2016 at a teaching hospital affiliated with Ilam University of Medical Science. Studies show that predictive factors for LBW are gestational age ≥36 weeks, number of fetuses, preeclampsia, premature rupture of membranes, placenta previa, number of pregnancies, and maternal education.
A7	Development of early detection of low-birth-weight instrument based on maternal risk factors: A mixed-methods study Indonesia 2023 [20]	To develop a tool based on maternal risk factors to identify the likelihood of having a baby with LBW.	A mix-methods: sequential explanatory study, the sample was 20 participants for the qualitative stage and 321 respondents for the quantitative stage. The sampling technique used was purposive sampling.	For the qualitative stage, data was collected through FGD with 20 health experts, and for the quantitative stage, from 321 pregnant women in three hospitals in Surabaya. Risk factors in the developed instrument consist of a history of giving birth to a LBW baby, working mother, parity, gestational age <37 weeks, gamelli, maternal education, preeclampsia, haemoglobin <8 g/dl in the first trimester, <10.5 g /dl in the second trimester, history of chronic hypertension, history of diabetes mellitus.

DISCUSSION

The articles used in this scoping review consisted of one article (14,3%) published in 2018, one article (14,3%) in 2019, one article (14,3%) in 2020, two articles (28,6%) in 2021 and two articles (28,6%) in 2023. Of the seven articles, two (28,6%) of them applied a cross-sectional research design four (57,1%) used a cohort study research design, and one (14,3%) mix-methods research design. Article characteristics by country Indonesia, Ethiopia, India and Iran. Based on the critical appraisal conducted on five articles, the resultswere five articles (71,4%) with an A grade and two articles (28,6%) with a B grade.

Seven articles (A1-A7) were identified, presenting various methods for early detection of LBW. A1 and A2 utilized third-trimester pregnancy weight as a predictive

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measure, with sensitivity values of 95.9% and 67%, respectively. A3 introduced nomograms incorporating factors such as maternal age <20 years, haemoglobin levels <11 mg/dL, and preeclampsia. A4 and A5 developed antenatal risk-scoring scales focusing on factors like weight gain and maternal health status. Additionally, A6 leveraged data mining techniques to identify predictors, while A7 proposed a maternal risk factor-based instrument. Collectively, these studies highlight diverse and effective methods for identifying LBW risks during antenatal and pre-conception periods.

The selected articles identified two key themes in early detection methods for LBW: those applied during the pre-conception period and those during the antenatal period. Pre-conception methods predominantly utilize maternal risk scoring systems based on characteristics such as age, BMI, and comorbidities, providing a predictive framework for LBW risk. Antenatal methods, on the other hand, leverage tools like third-trimester weight thresholds, nomograms, and antenatal risk scoring scales to refine detection accuracy. These methods demonstrate how both maternal characteristics and advanced diagnostic tools can aid in identifying high-risk pregnancies, and facilitating timely interventions to prevent LBW.

Early Detection Methods for LBW in the Pre-conception Period

Early detection of LBW during pregnancy and even before pregnancy can prevent the occurrence of LBW with appropriate interventions. The developed and validated risk scoring scale is one of the methods in detecting LBW .A study conducted in Ethiopia among 379 pregnant women developed a predictive risk score for low birth weight (LBW) based on maternal characteristics. Key indicators included maternal age under 20 years, BMI below 18.5, height under 155 cm, haemoglobin levels below 11.0 mg/dL, primigravida status, and the presence of comorbidities. The resulting risk score, categorized into low (<4), medium (4-6), and high (>6) classifications, demonstrated strong diagnostic performance with an AUC of 0.83, sensitivity of 71%, and specificity of 82%. These findings underscore the utility of tailored risk-scoring models in identifying high-risk pregnancies, enabling more precise and proactive interventions to reduce LBW incidence [17].

AUC (*Area Under the Curve*) is an assessment of the ability of a test to detect a disease, the wider the AUC, the better the ability to detect a disease. In this method, the AUC value is 0.83, which means that the risk score method for predicting LBW based on maternal characteristics has a good ability to detect the risk of LBW. The higher the sensitivity and specificity values, the better the ability of a test to declare people who are sick and not sick. This method has good sensitivity and specificity values in predicting LBW [21]. Age at risk for pregnancy and childbirth is age less than 20 years or above 35 years. At the age of <20 years, the reproductive organs are not ready for pregnancy and childbirth, while at the age of >35 years there are changes in the tissues of the gynaecological organs [22].

If the food consumed by pregnant women is not able to meet the increased need for energy, protein, fat, vitamins, and minerals during pregnancy, the impact will be malnutrition in pregnant women. This condition can lead to low birth weight, premature birth, and various health difficulties or risks that may lead to death. Some things that need to be considered so that during pregnancythere are no problems, both for the mother and the fetus, namely the mother's weight beforepregnancy < 42 Kg, the mother's height is less than 145 cm, the mother's weight in the first trimester < 40 Kg, the Body Mass Index (BMI) before pregnancy < 17.0 and the mother suffers from anemia [23].

In this method, the characteristics of the mother have their respective score values consisting of age pregnancy (<20) with score 2.5, BMI (<18.5) with score 2.5, maternal height (<155cm) with score 2, haemoglobin (<11.0 mg/dl) with score 2, primigravida with score 1 and comorbidities with score 2.5. The score is summed

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according to the characteristics of the mother and then classified into low risk if the score is <4, medium risk if the score is 4-6 and high risk if the score is >6 [17]. This method can be used before pregnancy by paying attention to the characteristics of the mother so that appropriate interventions can be given to prevent LBW births.

Early Detection Methods for LBW in the Antenatal Period

During pregnancy, there is a process of growth, including the growth of the fetus and various organs that support fetal development. Increased metabolism in pregnant women requires an additional supply of vitamins, minerals, energy, protein, and fat. If these nutritional needs are not met through the consumption of food by pregnant women, this can result in malnutrition. Pregnant women who are malnourished run the risk of several difficulties or health risk, including low birth weight early delivery, and even death [23]

The weight gain experienced by a pregnant woman can be used as a means of assessing their nutritional condition. In Trimester-1 pregnancy, body weight increases by 1.5-2 kg, in Trimester-2 body weight increases by 4-6 kg and in Trimester-3 body weight increases by 6-8 kg, so that the total weight gain during pregnancy is 11.5-16 kg [24]. The incidence of LBW can be detected through weight gain during pregnancy. Pregnancy weight gain was found to have a bigger impact on birth weight than prenatal body mass index [25].

Based on the literature in this scoping review, it was found that pregnancy weight in the third trimester can be used as a method in early detection of LBW. A cross-sectional study carried out on 150 pregnant women in Indonesia found that a cut-off point of 60.5 kg during the third trimester of pregnancy can predict low birth weight with a sensitivity of 95.9% and specificity of 76.2%. With an AUC value of 0.919, this approach indicates “Excellent” (0.90-1) diagnostic test accuracy. This threshold effectively distinguishes between low birth weight and normal weight [14]. In comparison, Monnet's (2022) study explored the relationship between low pre-pregnancy BMI (below 18.5 kg/m²) and obstetric outcomes. It showed that inadequate weight gain during pregnancy is associated with a higher risk of small-for-gestational-age (SGA) babies and other complications such as premature rupture of membranes, anemia, and intrauterine growth restriction [26].

Prevention of LBW can be done by monitoring pregnancy weight gain during Antenatal Care (ANC). Through ANC, healthcare providers can provide health-related information, so that mothers can increase their nutritional intake and increase their weight optimally [15]. In contrast to another study in Indonesia conducted on 278 mothers, the AUC value was 0.68 with a cut-off point of 58.9 kg, sensitivity 67%, and specificity 63% can predict low birth weight. Mothers with an initial trimester 3 weight ≤ 59.8 kg have a risk of more than 3.38 times (OR = 3.38) to give birth to a low birth weight baby. The cut-off value in this study is lower than the results ofthe study by Adawiyah et al (2021) [14]. This difference is because research conducted in clinics is different when comparedto research conducted in rural communities. Mothers who visit the clinic for ANC are usually from the middle and upper socioeconomic groups, while in rural communities who visit health centers are from low socioeconomic groups. Prenatal care that is started as early in pregnancy as feasible and continued is the most effective way to prevent low birth weight [27]. In order to lower neonatal morbidity and mortality, early prediction models are used to identify pregnant women who are at high risk of LBW, make therapeutic decisions, and encourage early attention.

Maternal factors that influence the occurrence of LBW are maternal age, parity, primigravida, nutritional status, pregnancy spacing, socioeconomic status, employment and prenatal examination [22]. According to the findings of study

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conducted in Ethiopia aimed at developing and validating a nomogram to predict LBW, it was discovered to include preeclampsia, primigravida, unexpected pregnancy, maternal age at conception, and haemoglobin [16]. The association between haemoglobin levels and low birth weight can be explained by inadequate gestational nutrition, which results from disruptions in uteroplacental circulation, thereby increasing the risk of adverse pregnancy outcomes [20].

The result of each prognostic signal from the nomogram can be combined by health professionals to determine the probability of LBW risk in pregnant women. This nomogram has an AUROC of 84.3%, sensitivity of 78.0% and specificity of 91.0%. This demonstrates how effective the nomogram's discriminating ability is.

An additional study carried out in India, which developed an antenatal risk assessment scale for the prediction of low birth weight (LBW), identified risk factors as follows meal frequency <4, hard work, <6 hours of sleep and illiteracy, antenatal morbidity, weight gain <10 kg, maternal weight <40 kg, and anemia during the first semester. The classification of low (<12), medium (12-15) and high risk (>15) LBW with a sensitivity value of 98.6% and specificity of 41.1% is good [18]. Another research found that mothers who gain less than 7 kg during pregnancy are at higher risk of giving birth to babies with low birth weight. Limited weight gain may indicate inadequate nutritional intake or other health problems that affect fetal development [19].

All the literature in this review describes methods for early detection of LBW with good outcomes. These methods help identify pregnant women who are more likely to give birth to a low weight baby, help make clinical decisions and promote early intervention to lower neonatal morbidity and mortality rates. Based on the findings and discussions, the authors suggest that early detection methods for low birth weight (LBW), including pregnancy weight monitoring, nomograms, and risk scoring scales, are essential tools for identifying high-risk pregnancies, facilitating timely interventions, and ultimately enhancing maternal and neonatal health outcomes across diverse populations.

Strengths of this study include a comprehensive search strategy that utilized multiple databases (PubMed, Science Direct, Wiley Online Library) and search engines (Google Scholar), ensuring broad coverage of relevant literature and minimizing publication bias. Additionally, a rigorous critical appraisal was conducted, with the majority of articles receiving high grades (A), supporting the validity and reliability of the findings. Furthermore, the study provides an in-depth analysis of various early detection methods for LBW, including innovative techniques such as nomograms and risk scoring, which have significant potential for improving clinical decision-making. However, the study's limitations include potential geographic and socioeconomic bias, as most of the included studies were conducted in specific countries (Indonesia, Ethiopia, India, and Iran), which may limit the generalizability of the findings to high-income countries or regions with differing healthcare systems and population characteristics.

CONCLUSION

This review identifies the diversity and effectiveness of early detection methods for low birth weight (LBW) during both the pre-conception and antenatal periods. In the pre-conception period, risk scores based on maternal characteristics like age, BMI, and haemoglobin levels are effective tools, while antenatal methods such as monitoring third-trimester pregnancy weight, nomograms, and antenatal risk scoring scales provide reliable predictions. These diverse approaches allow for early identification of at-risk pregnancies, enabling timely interventions to reduce LBW and its associated complications. Integrating these detection methods into maternal health programs, especially in regions with high LBW prevalence, can significantly improve maternal and infant health outcomes.

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REFERENCES

[1] WHO/UNICEF, "The extension of the 2025 Maternal, Infant and Young Child nutrition targets to 2030: Discussion paper," New York, 2019.
[2] Kemenkes RI, *Profil Kesehatan Indonesia*. Jakarta: Kementerian Kesehatan RI, 2022.
[3] C. Schuler, F. Agbozo, G. E. Ntow, and V. Waldboth, "Health-system drivers influencing the continuum of care linkages for low-birth-weight infants at the different care levels in Ghana," *BMC Pediatr.*, vol. 23, no. 1, p. 501, 2023.
[4] Rosdiana, M. A. Arifin, and S. Rahmadani, "Faktor yang Berhubungan Dengan Kinerja Petugas KIA di Puskesmas Tuppu Kecematan Lembang Kabupaten Pinrang," *Sehat Rakyat (Jurnal Kesehat. Masy.*, vol. 1, no. 2, pp. 142–149, 2022.
[5] A. Novitasari, M. S. Hutami, and T. Y. R. Pristya, "Pencegahan dan Pengendalian BBLR Di Indonesia: Systematic Review," *Pencegah. Dan Pengendali. Bblr Di Indones.*, vol. 2, no. 3, pp. 175–182, 2020.
[6] Sri Wahyuni, Yustina Ananti, and Chentia Misse Issabella, "Hubungan Anemia Kehamilan Dengan Kejadian Berat Badan Lahir Rendah (Bblr): Systematic Literatur Review," *J. Heal.*, vol. 8, no. 2, pp. 94–104, 2021.
[7] S. Mak and A. Thomas, "Steps for Conducting a Scoping Review," *J. Grad. Med. Educ.*, vol. 14, no. 5, pp. 565–567, 2022.
[8] A. C. Tricco *et al.*, "PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation," *Ann. Intern. Med.*, vol. 169, no. 7, pp. 467–473, 2018.
[9] S. Dash, S. K. Shakyawar, M. Sharma, and S. Kaushik, "Big data in healthcare: management, analysis and future prospects," *J. Big Data*, vol. 6, no. 1, 2019.
[10] M. D. J. Peters, C. M. Godfrey, H. Khalil, P. McInerney, D. Parker, and C. B. Soares, "Guidance for conducting systematic scoping reviews," *Int. J. Evid. Based. Healthc.*, vol. 13, no. 3, pp. 141–146, 2015.
[11] M. J. Page *et al.*, "The PRISMA 2020 statement: An updated guideline for reporting systematic reviews," *BMJ*, vol. 372, 2021.
[12] Joanna Briggs Institute, "Checklist for Analytical Cross Sectional Studies - Critical Appraisal tools for use in JBI Systematic Reviews," *Joanna Briggs Inst. Crit. Apprais. tools use JBI Syst. Rev.*, pp. 1–6, 2020.
[13] Q. Nha *et al.*, *Mixed Methods Appraisal Tool (MMAT) Version 2018 User guide*. Departement of Family Medicine, 2018.
[14] A. R. Adawiyah, K. Djokosujono, N. Alam, and N. A. Setiawati, "An Effective Method to Predict Low Birth Weight in Indonesia Rural Area," *Indones. J. Public Heal. Nutr.*, vol. 2, no. 1, 2021.
[15] K. Djokosujono, W. K. Y. Putra, D. M. Utari, and I. A. Fajarini, "Prediction of low birth weight based on maternal third trimester weight among mothers at a maternal clinic in Jakarta, Indonesia," *Media Gizi Indones*, vol. 16, no. 2, p. 106, 2021.
[16] B. M. Fente, G. A. Tesema, T. W. Gudayu, and M. M. Asaye, "Development and validation of a nomogram for predicting low birth weight among pregnant women who had antenatal care visits at Debre Markos Comprehensive and Specialized Hospital, Ethiopia.," *Front. Med.*, vol. 10, p. 1253490, 2023.
[17] H. Y. Hassen, S. H. Gebreyesus, B. S. Endris, M. A. Roro, and J.-P. Van Geertruyden, "Development and Validation of a Risk Score to Predict Low Birthweight Using Characteristics of the Mother: Analysis from BUNMAP Cohort in Ethiopia.," *J. Clin. Med.*, vol. 9, no. 5, May 2020.

https://doi.org/10.34011/jmp2k.v35i1.2565

e-ISSN: 2338-3445
p-ISSN: 0853-9987

[18] A. K. P. Avinash Hindurao Salunkhe, "Antenatal Risk Scoring Scale for Predication of Low Birth Weight and Its Validity," *Indian J. Community Med.*, vol. 42, no. 1, pp. 147–50, 2019.
[19] S. G. Ghahfarokhi, J. Sadeghifar, and M. Mozafari, "A Model to Predict Low Birth Weight Infants and Affecting Factors Using Data Mining Techniques," vol. 5, no. 3, pp. 1–8, 2018.
[20] S. Utami, R. Susilaningrum, N. Nursalam, E. S. Zulaecha, and S. Rahayu, "Development of early detection of low-birth-weight instrument based on maternal risk factors: A mixed-methods study," *J. Keperawatan Padjadjaran*, vol. 11, no. 2, pp. 133–140, 2023.
[21] Akrom, "Modul Evidence Based Medicine Uji Diagnosis," *Piko Uad*, p. 7, 2020.
[22] A. Wicaksana and T. Rachman, *Model Momming Guide Kangoroe Mother Care Skin To Skin Contact Terhadap Kestabilan Suhu Tubuh Dan Berat Badan Pada Bblr Di Puskesmas*, vol. 3. Yogyakarta: Poltek Usaha Mandiri, 2019.
[23] A. H. Fitriah and I. D. N. Supariasa, *Buku Praktis Gizi Ibu Hamil*. Malang: Media Nusa Creative, 2018.
[24] Pusat Promosi Kesehatan Kementerian Kesehatan RI, "Peningkatan Kesehatan Ibu dan Anak Bagi Bidan dan Perawat," *Kementrian Kesehat. RI*, pp. 1–60, 2014.
[25] R. J. C. P. Lima *et al.*, "Prepregnancy body mass index, gestational weight gain, and birth weight in the BRISA cohort," *Rev. Saude Publica*, vol. 52, pp. 1–10, 2018.
[26] A. Montvignier Monnet, D. Savoy, L. Préaubert, P. Hoffmann, and C. Bétry, "In Underweight Women, Insufficient Gestational Weight Gain Is Associated with Adverse Obstetric Outcomes," *Nutrients*, vol. 15, no. 1, pp. 4–11, 2023.
[27] UNSAID GAPPS, "Profile of Preterm and Low Birth Weight Ethiopia Prevention and Care," no. May, pp. 10–12, 2017.

https://doi.org/10.34011/jmp2k.v35i1.2565