



The Impact of Health Interventions on Obstetric and Perinatal Outcomes in Adolescent Pregnancy: A Systematic Literature Review

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ABSTRACT

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Adolescent pregnancy is associated with increased risks of obstetric complications (anemia, preeclampsia, and delivery problems) and adverse perinatal outcomes such as low birth weight, prematurity, and neonatal death. Specific health interventions, including nutritional supplementation, counseling, health education, and group based antenatal care (ANC), have been proposed to mitigate these risks. This study aimed to identify and analyze the impact of specific health interventions including nutritional supplementation, counseling, group ANC, and health education on obstetric and perinatal outcomes in adolescent pregnancies through a systematic literature review (SLR). This review followed the PRISMA 2020 framework, encompassing four stages: identification, screening, eligibility, and inclusion. Articles were searched from Scopus and Google Scholar using defined keywords. Of 241 records identified, 41 full-text articles were reviewed, and 7 met the inclusion criteria (quantitative studies or systematic reviews evaluating specific interventions among pregnant adolescents). Nutritional supplementation, particularly iron and folic acid, effectively reduced anemia and improved birth weight. Counseling and health education enhanced adolescents' knowledge, attitudes, and ANC compliance. Group ANC models reduced low birth weight and preterm birth while promoting social support. Specific health interventions significantly improve obstetric and perinatal outcomes among adolescent pregnancies. Further experimental studies with rigorous designs are needed to strengthen causal evidence.

INTRODUCTION

Adolescent pregnancy remains a significant public health issue, particularly in developing countries where early marriage is still prevalent. Pregnant adolescents face higher risks of adverse obstetric and perinatal outcomes due to biological immaturity, limited access to healthcare services, and low socioeconomic status ⁽¹⁾. Globally, it is estimated that around 21 million adolescent girls aged 15–19 become pregnant each year, with approximately 12 million giving birth ⁽²⁾. These numbers reflect ongoing inequalities in reproductive health services and underscore the urgent need for evidence based interventions to improve maternal and neonatal outcomes among adolescents.



Adolescent pregnancy is strongly associated with obstetric complications such as anemia, preeclampsia, prolonged labor, and postpartum hemorrhage ⁽³⁾. In addition, infants born to adolescent mothers face increased risks of low birth weight, prematurity, and neonatal death ⁽⁴⁾. These complications not only endanger maternal and infant survival but also perpetuate intergenerational cycles of poor health and poverty, particularly in low and middle income countries (LMICs).

To mitigate these risks, various health interventions have been introduced. Nutritional supplementation especially iron and folic acid has proven effective in reducing anemia and improving birth weight ⁽⁵⁾. Counseling and reproductive health education have shown positive impacts on adolescent mothers' knowledge, attitudes, and adherence to antenatal care ⁽⁶⁾. Group based antenatal care (ANC) has emerged as an innovative model to strengthen peer support, enhance ANC attendance, and improve birth outcomes in resource limited settings ⁽⁷⁾. However, despite these documented benefits, the integration and comparative effectiveness of these interventions specifically among adolescents remain inconsistently reported across studies.

Although previous studies have established that nutritional supplementation, counseling, and ANC attendance improve maternal outcomes in general populations, there is limited synthesis of evidence focusing exclusively on adolescent pregnancies. Most existing reviews include adult women or mixed-age samples, making it difficult to isolate the unique physiological and psychosocial factors influencing adolescent mothers⁽⁸⁾. Furthermore, research gaps remain in understanding the comparative effectiveness of individual versus group ANC models and the extent to which combined interventions such as integrated counseling and supplementation affect obstetric and perinatal outcomes. Limited evidence also exists on the long-term impact of these interventions on neonatal mortality, preterm birth, and maternal health literacy in LMIC contexts. Addressing these knowledge gaps is crucial for developing tailored public health strategies that effectively support pregnant adolescents.

Therefore, this systematic literature review (SLR) aims to identify and comprehensively analyze the impact of specific health interventions including nutritional supplementation, counseling, group based antenatal care (ANC), and health education on obstetric and perinatal outcomes in adolescent pregnancies. The findings are expected to provide a strong evidence base for developing maternal health policies and practices tailored to adolescents.

METHOD

This study employed a systematic literature review (SLR) guided by the PRISMA 2020 framework, which consists of four main stages: identification, screening, eligibility, and inclusion⁽⁹⁾. The review focused on specific health interventions and their effects on obstetric and perinatal outcomes among pregnant adolescents. The research questions were structured using the PICOS framework (Population, Intervention, Comparison, Outcomes, Study design).

The initial literature search was conducted using the Scopus and Google Scholar databases. During the identification stage, articles were retrieved using predefined keywords and Boolean operators (AND, OR, NOT) to ensure comprehensive and targeted results. Search terms combined "teenage pregnancy," "adolescent pregnancy," "pregnant adolescent," with "maternal health intervention," "antenatal care," "health education," or "counseling," and outcome-related terms such as "obstetric outcomes," "perinatal outcomes," "birth outcomes," "preterm birth," "low birth weight," or "neonatal mortality."

The inclusion criteria were:

1. Studies published between 2020 and 2025 in peer-reviewed journals,
2. Studies focusing on pregnant adolescents (<20 years),
3. Research that evaluated specific health interventions (nutritional supplementation, counseling, group antenatal care, or health education), and





4. Studies reporting obstetric or perinatal outcomes (e.g., anemia, preterm birth, low birth weight, neonatal mortality).

Eligible designs included quantitative studies (cross sectional, cohort, case control, or randomized controlled trials) and systematic reviews or meta analyses relevant to the topic. Exclusion criteria comprised studies without clear intervention or outcome measures, non adolescent populations, psychosocial only studies, or those lacking full text access.

Data extraction was carried out systematically using a standardized data extraction form covering study characteristics (author, year, country, study design, sample size), type of intervention, outcome measures, and key findings. Two independent reviewers performed the extraction process, and discrepancies were resolved through consensus to minimize bias.

The synthesis followed a narrative thematic approach, as the included studies varied in design, population, and outcome measures. Themes were identified through iterative coding and grouping of findings related to four key intervention categories: (1) nutritional supplementation, (2) counseling, (3) group antenatal care, and (4) health education. Thematic synthesis was used to interpret similarities and differences in outcomes across studies, highlighting consistent patterns and unique contextual factors.

The methodological quality of included studies was appraised using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist tailored to the respective study design (10). The assessment criteria included:

1. clarity of research objectives,
2. appropriateness of study design,
3. validity of measurement tools,
4. identification and control of confounding variables, and
5. adequacy of data analysis and reporting.

Each study was classified as high, moderate, or low quality based on the number of checklist criteria fulfilled. Only studies rated as moderate to high quality were prioritized in the final synthesis to ensure reliability of the conclusions.

To minimize publication bias, several strategies were employed. Multiple databases were searched to capture both published and gray literature, thereby reducing overrepresentation of studies with positive findings. Furthermore, inclusion was not restricted by geographical location, ensuring global representation of data. Data extraction and quality appraisal were performed independently by two reviewers to limit subjective interpretation. Discrepancies in study inclusion or interpretation were resolved through consensus discussions.

Additionally, the risk of language bias was mitigated by including English-language studies from diverse international journals, while database filtering ensured recency and methodological quality. This review used publicly available data; hence, ethical approval was not required. However, all processes adhered to principles of research integrity, transparency, and citation accuracy following the PRISMA 2020 reporting standards.

Through this process, a total of 241 articles were initially identified. After screening by title, abstract, and duplication, 82 articles remained. Of these, 41 full text articles were reviewed in detail, and 7 studies were ultimately included in the synthesis, having fulfilled all inclusion criteria and reported relevant interventions and outcomes. The flow of the article selection process is presented in Figure 1.

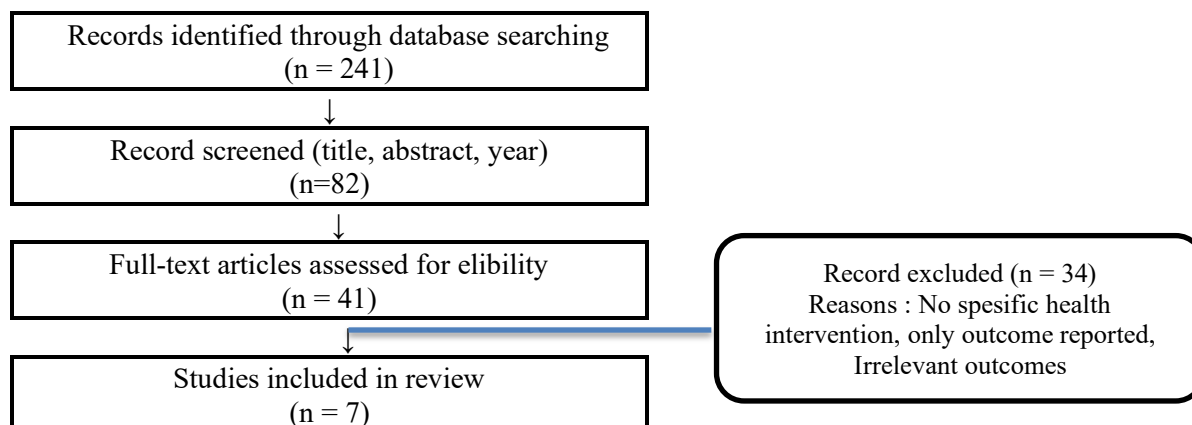


Figure 1. PRISMA Flow Diagram of the Systematic Literature Review

RESULT AND DISCUSSION

Figure 1 illustrates the flow of the systematic search process. A total of 241 records were initially identified. After removing duplicates and screening based on titles and abstracts, 82 articles were retained. Further evaluation of publication year and relevance reduced the number to 41 full-text articles, which were then assessed for eligibility. Of these, 34 articles were excluded because they did not examine specific health interventions, focused only on outcomes without intervention, or reported irrelevant outcomes. Finally, 7 studies met the inclusion criteria and were included in this review, as they specifically evaluated health interventions and reported obstetric or perinatal outcomes among pregnant adolescents.

The interventions included nutritional supplementation (iron, folic acid, micronutrients), nutrition and reproductive health counseling, health education, and group-based Antenatal Care (ANC). Most interventions demonstrated positive effects, including the prevention of maternal anemia, improvement of birth weight, reduction of low birth weight and prematurity, and increased adherence to ANC visits. However, evidence on neonatal mortality remained limited.

Tabel 1. Systematic review

Authors	Title	Year	Methodology	Intervensi	Outcome	Region
D.P., Sari, Diah Puspita; M., Ekoriano, Mario; R., Pujihasvuty, Resti; S., Kistiana, Sari; S.L., Nasution, Sri Lilestina; I., Ardiana, Irma; E., Purwoko, Edy; Y.P., Devi, Yuli Puspita; M., Muthmainnah, Muthmainnah	Antenatal care utilization on low birth weight children among women with high-risk births	2024	Cross-sectional study (observational)	Antenatal care utilization and iron supplementation	≥8 ANC visits and iron intake associated with lower risk of low birth weight	Indonesia



Authors	Title	Year	Methodology	Intervensi	Outcome	Region
L.F.B., Tavares, Luis Fernando Barbosa; E.N., Adamson-Macedo, Elvidina Nabuco	Child mortality remains a serious public health problem	2023	Retrospective cohort study (observational)	Quality improvement of maternal and child health services	Reduced infant mortality and increased exclusive breastfeeding rate	China
Z., Qi, Zhiye; Y., Wang, Yanchen; G., Lin, Guang; H., Ma, Haiyan; Y., Li, Yaojin; W., Zhang, Weiquan; S., Jiang, Siyuan; X., Gu, Xinyue; Y., Cao, Yun; W., Zhou, Wenhao	Impact of maternal age on neonatal outcomes among very preterm infants admitted to Chinese neonatal intensive care units: a multi-center cohort study	2022	Multi-center cohort study (observational)	Maternal age and prenatal care characteristics	Older maternal age correlated with increased cesarean delivery and neonatal morbidity	China
D., Rasella, Davide; F.J.O., Alves, Flávia Jôse Oliveira; P., Reboucas, Poliana; G.S., de Jesus, Gabriela Santos; M.L., Barreto, Mauricio L.; T., Campello, Tereza; E.S.D., Paixao, Enny Santos Da	Long-term impact of a conditional cash transfer programme on maternal mortality: a nationwide analysis of Brazilian longitudinal data	2021	Ecological longitudinal study Cross-sectional survey (observational)	Conditional cash transfer program (Bolsa Familia)	Reduced maternal mortality and improved prenatal care coverage	Brazil
P., Singh, Pooja; K.K., Singh, Kaushalendra K.; P., Singh, Pragya	Maternal health care service utilization among young married women in India, 1992–2016: trends and determinants	2021	Retrospective cohort study (observational)	Maternal health service utilization under Janani Suraksha Yojana program.	Increased skilled birth attendance and institutional delivery	India
D.J.P., Honorato, Danylo José Palma; I., Fulone, Izabela; M.T., Silva, Marcus Tolentino; L.C., Lopes, L. C.	Risks of Adverse Neonatal Outcomes in Early Adolescent Pregnancy Using Group Prenatal Care as a Strategy for Public Health Policies: A	2021	Retrospective study / secondary data analysis	Group antenatal care model	Reduced low birth weight and preterm birth; improved Apgar score	Brazil



Authors	Title	Year	Methodology	Intervensi	Outcome	Region
C.T., Motta, Caio Tavares; M.R., Moreira, Marcelo Rasga	Retrospective Cohort Study in Brazil Will Brazil comply with the sdg 3.1 of the 2030 agenda? an analysis of maternal mortality, from 1996 to 2018; O Brasil cumprirá o ODS 3.1 da Agenda 2030? Uma análise sobre a mortalidade materna, de 1996 a 2018	2021	Retrospective study / secondary data analysis	Maternal health policy implementation (PAISM, PHPN, PNAISM)	Declining maternal mortality ratio (MMR) between 1996–2018	Brazil

The findings highlight that iron and folic acid supplementation effectively reduces anemia risk and improves perinatal outcomes. Similar results were reported in a Cochrane meta analysis by Haider and Bhutta, which found that multiple micronutrient supplementation significantly decreased anemia prevalence and improved birth weight among pregnant women ⁽⁵⁾. Subsequent studies by Lee et al. and Nguyen et al confirmed that iron folic acid supplementation during adolescence and early pregnancy enhances maternal hemoglobin and neonatal outcomes ^(11,12).

Nutrition counseling and health education contributed to improved knowledge, attitudes, and health-seeking behavior among pregnant adolescents, thereby supporting early detection of complications and better pregnancy management. Evidence from Ethiopia and Ghana also demonstrated that regular nutrition counseling integrated into antenatal care led to higher dietary diversity and lower rates of low birth weight ⁽¹³⁾.

Group antenatal care (ANC) emerged as an effective innovation, particularly in low- and middle-income settings. A systematic review by Sharma et al and a more recent analysis by Musabyimana et al revealed that group ANC significantly improved ANC attendance, reduced preterm birth, and enhanced maternal satisfaction ^(7,14). Evidence from Brazil indicated that group based ANC reduced the incidence of low birth weight and prematurity, while simultaneously strengthening social support networks ⁽¹⁵⁾. This is especially relevant for adolescent mothers who often face social stigma and lack family support.

Overall, specific health interventions play a critical role in addressing both obstetric outcomes (anemia, labor complications) and perinatal outcomes (low birth weight, prematurity). Nevertheless, the limited number of experimental studies highlights the need for further research using robust designs such as randomized controlled trials (RCTs) or prospective cohorts to strengthen causal evidence.

Several studies emphasized that iron and folic acid supplementation can effectively prevent anemia among pregnant adolescents while also increasing birth weight ⁽⁵⁾. This is crucial, as anemia remains one of the most common complications in adolescent pregnancies ⁽³⁾. Nutrition counseling integrated into ANC services has also been shown to improve maternal nutritional status and reduce the





risk of delivering low birth weight infants ⁽¹³⁾. Thus, nutritional interventions benefit not only maternal health but also perinatal outcomes.

Studies assessing the effects of counseling and health education revealed significant improvements in adolescents' knowledge, attitudes, and compliance with ANC visits ⁽¹⁶⁾. Health education provided early in pregnancy plays a role in the timely detection of complications and supports better decision-making for both maternal self-care and fetal well being ⁽¹⁷⁾. These findings are consistent with the Health Belief Model, which emphasizes perceived benefits and risks as key determinants of health behavior change.

Group ANC has emerged as a particularly relevant innovation for adolescent populations, especially in low and middle income countries. Evidence from Brazil showed that group based models were more effective than individual ANC in reducing low birth weight and prematurity rates ⁽¹²⁾. The strength of this approach lies in the provision of social support, shared experiences, and a sense of belonging, which collectively increase adherence to ANC visits ⁽¹⁾. This is particularly important for adolescent mothers who often face social stigma and limited family support.

Most of the reviewed studies reported positive effects of interventions on obstetric outcomes (such as anemia and labor complications) as well as perinatal outcomes (including low birth weight, prematurity, and neonatal death). For instance, research from Ghana demonstrated a strong association between the quality of ANC and reductions in both low birth weight and preterm birth ⁽¹³⁾. Nevertheless, evidence directly linking interventions to reductions in neonatal mortality remains scarce, warranting further investigation ⁽⁴⁾.

These findings suggest that nutrition-based interventions, counseling, and group ANC should be integrated into maternal health policies, particularly those targeting adolescents. Large-scale programs such as Brazil's conditional cash transfer scheme ⁽⁷⁾ and India's ANC support initiatives ⁽¹⁴⁾ illustrate how structured interventions can yield broad improvements in maternal and neonatal outcomes. Therefore, a multisectoral approach that combines medical, social, and educational support is essential to improve the overall health of pregnant adolescents ⁽¹⁸⁾.

CONCLUSION

Iron and folic acid supplementation significantly reduces anemia and increases birth weight, while counseling and health education enhance adolescents' knowledge, attitudes, and adherence to antenatal care. Moreover, group-based ANC effectively reduces low birth weight and preterm delivery while fostering social support among adolescent mothers.

Future research should employ experimental or longitudinal designs to better establish causal relationships between specific interventions and maternal or neonatal outcomes in adolescents. Further studies are also needed to evaluate cost effectiveness and sustainability of group based ANC and counseling models, as well as their integration into national health systems.

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