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EFFECT OF MULTIDISCIPLINARY CARE ON NEONATAL OUTCOMES IN HIGH-RISK PREGNANCIES. A SYSTEMATIC REVIEW

Systematic Review

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ABSTRACT

Background: High-risk pregnancies are associated with elevated neonatal complications, including preterm birth, low birth weight, and increased neonatal intensive care unit (NICU) admissions. Although traditional obstetric care focuses on maternal monitoring, growing evidence suggests that multidisciplinary care (MDC)—which involves coordinated management by various healthcare specialists—may significantly enhance neonatal outcomes. However, a consolidated analysis of MDC's impact on neonatal health across different high-risk populations remains limited.

Objective: This systematic review aims to evaluate the effectiveness of multidisciplinary care in reducing neonatal complications among women with high-risk pregnancies compared to conventional care models.

Methods: A systematic review was conducted following PRISMA guidelines. Electronic databases including PubMed, Scopus, Web of Science, and Cochrane Library were searched for studies published between 2018 and 2024. Keywords included "Multidisciplinary Care," "High-Risk Pregnancy," and "Neonatal Outcome." Eligible studies included randomized controlled trials, cohort studies, and observational studies evaluating neonatal outcomes in the context of MDC. Data extraction and risk of bias assessments were independently performed by two reviewers using standardized tools such as the Cochrane Risk of Bias Tool and the Newcastle-Ottawa Scale.

Results: Eight studies involving over 2,000 high-risk pregnancies were included. MDC was associated with reduced rates of miscarriage, fetal death, neonatal hypoglycemia, macrosomia, and NICU admissions. Several studies reported statistically significant improvements, including a reduction in adverse neonatal outcomes from 60.8% to 3.5% ($p<0.001$), and improved immunologic and anthropometric neonatal profiles. Overall, MDC models demonstrated superior outcomes compared to routine obstetric care.

Conclusion: Multidisciplinary care significantly improves neonatal outcomes in high-risk pregnancies by offering coordinated, patient-centered interventions. Despite promising findings, limitations such as heterogeneity in study designs and sample sizes underscore the need for further large-scale, high-quality trials to refine care protocols and validate effectiveness across broader populations.

Keywords: High-Risk Pregnancy, Multidisciplinary Care, Neonatal Outcome, Systematic Review, Integrated Care, Maternal-Fetal Medicine.

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INTRODUCTION

High-risk pregnancies, defined by the presence of maternal, fetal, or placental complications, significantly increase the risk of adverse neonatal outcomes such as preterm birth, low birth weight, and neonatal intensive care unit (NICU) admissions. Globally, these pregnancies contribute to a substantial burden on maternal and neonatal healthcare systems, with complications like hypertensive disorders, gestational diabetes, and pre-existing maternal conditions being major contributors to neonatal morbidity and mortality. For instance, the incidence of NICU admissions among neonates from high-risk pregnancies can exceed 70%, with respiratory distress, prematurity, and sepsis being the most frequent causes (1). Despite advancements in obstetric care, the optimal model for managing high-risk pregnancies to mitigate neonatal complications remains debated. Traditionally, fragmented care involving multiple specialists without coordination has been associated with delays in decision-making and suboptimal outcomes. Recently, multidisciplinary care (MDC) models—integrating obstetricians, neonatologists, cardiologists, endocrinologists, and specialized nurses—have shown promising results. Observational data indicate that MDC substantially improves maternal and fetal outcomes, particularly in conditions such as rheumatic heart disease, gestational diabetes, and autoimmune disorders (2,3). Evidence suggests that multidisciplinary teams can reduce the risk of adverse neonatal outcomes such as miscarriage, fetal death, preterm birth, and neonatal hypoglycemia by improving prenatal monitoring, optimizing treatment regimens, and facilitating timely interventions (4). However, despite growing adoption, comprehensive evidence aggregating the effects of MDC on neonatal outcomes in high-risk pregnancies remains sparse, with studies varying in methodology and populations studied. Hence, a systematic review is warranted to consolidate current knowledge and identify effective components of MDC that directly contribute to improved neonatal health (5).

The primary research question is: "In pregnant women with high-risk conditions (P), does multidisciplinary care (I) compared to standard obstetric care (C) reduce neonatal complications such as preterm birth, NICU admission, and neonatal mortality (O)?" The objective of this systematic review is to evaluate and synthesize the evidence on the effectiveness of integrated healthcare models in reducing neonatal complications among high-risk pregnancies (6,7). This review will consider both randomized controlled trials and observational studies published globally between 2015 and 2024. It will adhere to the PRISMA guidelines to ensure methodological transparency and reproducibility. By focusing on diverse high-risk pregnancy populations, including those with cardiovascular, metabolic, and autoimmune disorders, the review aims to offer actionable insights for healthcare providers. Ultimately, this synthesis will contribute to clinical practice by clarifying the value of MDC in perinatal care, identifying best practices, and guiding policy development to improve neonatal outcomes in vulnerable maternal populations.

METHODS

This systematic review was conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure methodological rigor and reproducibility. A comprehensive literature search was undertaken using four electronic databases: PubMed, Scopus, Web of Science, and the Cochrane Library. The search strategy incorporated both MeSH terms and free-text keywords combined with Boolean operators. The primary terms included: “Multidisciplinary Care” OR “Multidisciplinary Team” AND “High-Risk Pregnancy” AND “Neonatal Outcome” OR “Neonatal Morbidity” OR “Neonatal Mortality”. Additional manual screening of reference lists from selected articles was performed to identify studies not captured by the electronic search. Eligibility criteria were pre-defined to include studies focusing on the effect of multidisciplinary care on neonatal outcomes among women with high-risk pregnancies. Included studies comprised randomized controlled trials (RCTs), cohort studies, and observational studies published in English from 2018 to 2024. The target population consisted of pregnant women identified as high-risk due to conditions such as pre-existing maternal disease (e.g., diabetes, hypertension, autoimmune disorders), obstetric complications (e.g., preeclampsia, multiple gestations), or fetal anomalies. Interventions assessed were models of multidisciplinary or integrated care involving coordinated input from two or more specialties. Comparators included standard or non-integrated care models. Studies were included only if they reported on neonatal outcomes such as preterm birth, NICU admission, neonatal mortality, or specific morbidities. Exclusion criteria encompassed non-English language articles, animal studies, conference abstracts, and non-peer-reviewed reports.

Study selection was carried out independently by two reviewers using EndNote X9 for reference management. After removal of duplicates, titles and abstracts were screened for relevance. Full-text reviews were conducted for potentially eligible studies.

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Disagreements were resolved by discussion or consultation with a third reviewer. The selection process is detailed in a PRISMA flow diagram. Data extraction was performed using a standardized extraction form developed a priori. Extracted variables included author(s), year of publication, study design, country of origin, sample size, maternal conditions, components of the multidisciplinary care model, comparator intervention, neonatal outcomes measured, and key findings. Assessment of methodological quality and risk of bias was undertaken using appropriate tools based on study design. For randomized controlled trials, the Cochrane Risk of Bias Tool was utilized. Observational and cohort studies were evaluated using the Newcastle-Ottawa Scale, considering parameters such as selection of cohorts, comparability, and assessment of outcomes. Each study was independently reviewed by two assessors and discrepancies were resolved by consensus.

Data synthesis involved a qualitative narrative approach given the expected heterogeneity in study design, population characteristics, and outcome measures. Although several studies reported similar endpoints, differences in intervention definitions and comparator arms precluded formal meta-analysis. Instead, findings were thematically grouped and summarized to highlight patterns and divergences in reported outcomes. Eight studies met the inclusion criteria and were included in the final synthesis. A study demonstrated a significant reduction in neonatal morbidity among women with rheumatic diseases managed in a multidisciplinary unit, with adverse neonatal outcomes falling from 60.8% to 3.5% following intervention (9). Another Study observed that multidisciplinary team-based continuous care for gestational diabetes mellitus led to significantly improved neonatal immune profiles and lower incidences of hypoglycemia and macrosomia (10). A study noted improved maternal outcomes without compromising neonatal health following implementation of a standardized multidisciplinary protocol for diabetes in pregnancy (11). Similarly, a study showed that despite intensive multidisciplinary care, pregnancies complicated by pre-gestational diabetes still experienced elevated neonatal risks, highlighting the need for further innovation in care strategies (12). A study focused on Centering Pregnancy group care models and observed improvements in hypertensive disorders and breastfeeding initiation rates among participants (13). A study implemented a best-practice model for mental health in high-risk pregnancies and achieved full compliance in psychosocial care criteria post-intervention (14). Another study reported favorable outcomes across cardiovascular disease subtypes in pregnancies managed through cardio-obstetrics teams, with preeclampsia rates notably reduced in congenital heart disease cohorts (15). Lastly, a study confirmed that structured prenatal education integrated with routine care, reduced rates of cesarean sections and improved neonatal anthropometric indices among high-risk mothers (16)

RESULTS

A total of 1,142 records were identified through the database search across PubMed, Scopus, Web of Science, and the Cochrane Library. After removing 236 duplicates, 906 records were screened based on titles and abstracts. Of these, 849 were excluded due to irrelevance to the research question or non-compliance with the inclusion criteria. The full texts of 57 articles were assessed for eligibility, resulting in the final inclusion of 8 studies that met all pre-established criteria. The study selection process adhered to PRISMA guidelines and is depicted through a structured flowchart to ensure transparency and replicability. The eight included studies varied in design, encompassing retrospective cohorts, prospective observational studies, and quasi-experimental trials, collectively analyzing over 2,000 high-risk pregnancies. Table 1 summarizes key characteristics of the studies. Sample sizes ranged from 90 to 509 women, with most studies focusing on populations affected by gestational diabetes, cardiovascular disease, autoimmune disorders, and other pregnancy-related complications. The multidisciplinary interventions incorporated care teams consisting of obstetricians, neonatologists, endocrinologists, cardiologists, rheumatologists, and mental health professionals, compared to conventional care models typically led by general obstetricians or fragmented specialist involvement.

Table 1: Multidisciplinary Interventions and Neonatal Outcomes

Author (Year)	Study Design	Sample Size	Condition Studied	Intervention	Primary Neonatal Outcomes
Añón-Oñate et al. (2021)	Retrospective Observational	198	Rheumatic disease and thrombophilia	Multidisciplinary care unit	Miscarriage rate, fetal death
Qi & Dong (2022)	Quasi-experimental	90	Gestational diabetes mellitus	MDT continuous nursing	Hypoglycemia, macrosomia, IgG levels
Morlando et al. (2021)	Retrospective cohort	131	Gestational/pre-gestational diabetes	Standardized multidisciplinary protocol	Macrosomia, cesarean rate

Author (Year)	Study Design	Sample Size	Condition Studied	Intervention	Primary Neonatal Outcomes
Karkia et al. (2023)	Screening cohort	509	Pre-gestational diabetes mellitus	High-risk diabetes antenatal clinic	NICU admission, HIE
Wagijo et al. (2024)	Stepped-wedge cluster trial	2124	Low-risk pregnancies	Group antenatal care (Centering Pregnancy)	Neonatal anthropometry, Apgar scores
Morlans-Lanau et al. (2022)	Implementation study	120	High-risk pregnancy with mental health concerns	Midwife-led continuity care	Psychosocial support compliance
Quiñones et al. (2021)	Retrospective cohort	253	Cardiovascular disease	Cardio-obstetrics program	Preterm birth, neonatal mortality
Rahimi et al. (2018)	Randomized clinical trial	150	Mixed high-risk pregnancy	Prenatal education + routine care	Neonatal weight, jaundice

The risk of bias across studies was assessed using the Cochrane Risk of Bias Tool for trials and the Newcastle-Ottawa Scale for cohort and observational designs. Most studies showed a low to moderate risk of bias. Common biases included lack of blinding (performance bias) in quasi-experimental designs and potential selection bias in retrospective cohorts. However, outcome reporting and data completeness were generally robust across studies. Main findings consistently supported the positive impact of multidisciplinary care on neonatal outcomes. A study reported a reduction in adverse neonatal outcomes from 60.8% to 3.5% ($p<0.001$), with a number needed to treat (NNT) of 1.74 to prevent one miscarriage (15). Similarly, a study observed significantly reduced neonatal hypoglycemia and improved immune parameters in the intervention group ($p<0.05$) (16). Furthermore, a study found a significant decrease in macrosomia rates (from 20% to 5.3%, $p=0.012$) and improved induction success rates without adverse neonatal trade-offs (17).

In contrast, a study demonstrated that despite comprehensive multidisciplinary follow-up, significant neonatal complications such as hypoglycemia and NICU admissions remained elevated in diabetic pregnancies, underlining the limits of current protocols in certain populations (18). A study showed that Centering Pregnancy models improved neonatal anthropometric measures and reduced hypertensive disorders, with p-values <0.05 for breastfeeding initiation and maternal morbidity (19). Furthermore, a study achieved 100% compliance in psychosocial care and depression screening post-intervention, indirectly supporting improved neonatal bonding and care continuity (20). A study reported better neonatal outcomes in congenital heart disease groups versus acquired conditions, suggesting the benefits of tailored multidisciplinary interventions depending on etiology ($p=0.009$ for preeclampsia rates) (21). Research highlighted significantly improved neonatal weights and reduced jaundice rates in high-risk pregnancies receiving structured prenatal education ($p<0.001$) (22). Collectively, these results confirm that multidisciplinary models—when applied consistently and tailored to patient needs—yield superior neonatal outcomes across a spectrum of high-risk obstetric conditions.

DISCUSSION

This systematic review found consistent evidence supporting the effectiveness of multidisciplinary care (MDC) models in improving neonatal outcomes among high-risk pregnancies. Across diverse maternal conditions including gestational diabetes, rheumatic and autoimmune diseases, and cardiovascular complications, MDC interventions were associated with a marked reduction in adverse neonatal events such as preterm birth, NICU admissions, neonatal hypoglycemia, macrosomia, and even fetal death. Most included studies demonstrated statistically and clinically significant benefits of coordinated care, particularly when interventions were tailored to the specific maternal condition and involved early, integrated monitoring by obstetricians, neonatologists, and disease-specific specialists (21,22). Compared to earlier studies and systematic reviews, the findings of this review align with the emerging global consensus on the value of collaborative perinatal care. For example, previous literature has reported improvements in maternal adherence, patient satisfaction, and maternal outcomes with MDC, though neonatal benefits had not been as extensively examined. The current review bridges this gap by confirming that neonatal complications can also be mitigated through structured interdisciplinary management. Notably, the dramatic drop in miscarriage and fetal death rates reported and the improved neonatal immunological profiles seen in the study provide direct clinical affirmation of MDC's neonatal impact (23-25). However, the persistence of elevated NICU

admissions in pregnancies complicated by diabetes, even under comprehensive MDC as shown in a study, suggests that multidisciplinary efforts may need further refinement in certain high-risk groups (26).

One of the key strengths of this review lies in its methodological comprehensiveness. A robust search strategy was employed across four major databases, with inclusion of both randomized and observational designs to capture real-world clinical diversity. The adherence to PRISMA guidelines, use of validated tools for risk bias assessment, and independent review of study selection enhanced the transparency and reliability of findings. Additionally, the review included only peer-reviewed studies from the past five years, ensuring clinical relevance and alignment with current healthcare practices. Nonetheless, certain limitations should be acknowledged. Sample sizes in several studies were relatively small, potentially limiting generalizability. There is also a possibility of publication bias, as negative studies or those reporting nonsignificant outcomes might remain unpublished. Heterogeneity in study designs, definitions of high-risk pregnancy, and outcome measures posed challenges to quantitative synthesis and meta-analysis. Moreover, some studies lacked detailed subgroup analyses that could help tailor MDC to specific maternal conditions. These findings have significant implications for both clinical practice and healthcare policy (27). The demonstrated benefits of MDC on neonatal outcomes support the integration of structured interdisciplinary teams in routine obstetric care for high-risk pregnancies. Healthcare systems should prioritize investments in training, communication pathways, and infrastructure that facilitate such models. Clinicians should also be encouraged to adopt condition-specific MDC protocols to improve neonatal safety. Future research should aim to delineate the individual contributions of various specialties within MDC, evaluate long-term neonatal outcomes, and explore cost-effectiveness to inform widespread implementation. Randomized controlled trials with larger sample sizes and standardized outcome definitions would further strengthen the evidence base and guide precision in clinical care delivery.

CONCLUSION

This systematic review highlights that multidisciplinary care models significantly enhance neonatal outcomes in high-risk pregnancies by reducing rates of preterm birth, neonatal morbidity, NICU admissions, and complications such as hypoglycemia and macrosomia. The evidence suggests that when care is coordinated across specialties and tailored to the specific maternal condition, neonatal safety and survival can be meaningfully improved. Clinically, these findings underscore the value of integrated approaches in obstetric management, advocating for broader implementation of multidisciplinary protocols in routine high-risk prenatal care. While the included studies were generally of moderate to high quality and consistently demonstrated favorable trends, the heterogeneity in designs and limited sample sizes call for cautious interpretation. Further large-scale, prospective research is essential to refine MDC frameworks, assess long-term neonatal health impacts, and solidify the cost-effectiveness and scalability of these models across diverse healthcare settings.

AUTHOR CONTRIBUTION

Author	**Contribution**
Sana Latif	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Unaiza Asif	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Mahboob Rahman Siddeiqe	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Tahneem Yaseen*	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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Muhammad Waqar Ali	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Fariha Ahsan	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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