



Maternal Race and Socioeconomic Status as Determinants of Neurodevelopment, Feeding, and Growth Outcomes in Preterm Infants: A Systematic Review

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Abstract

Preterm birth remains one of the leading causes of neonatal morbidity and mortality worldwide and is associated with substantial risks of impaired neurodevelopment, feeding difficulties, growth restriction, and long-term disability. Although advances in neonatal intensive care have significantly improved survival among preterm infants, disparities in health outcomes persist across different racial and socioeconomic groups. Maternal race and socioeconomic status (SES) have emerged as important social determinants of neonatal health, influencing access to prenatal care, maternal nutrition, pregnancy complications, quality of neonatal intensive care, breastfeeding practices, developmental follow-up, and family support. These determinants affect not only immediate neonatal outcomes but also cognitive, motor, behavioral, nutritional, and physical development throughout infancy and childhood. This systematic review synthesizes current evidence regarding the influence of maternal race and socioeconomic status on neurodevelopmental, feeding, and growth outcomes among preterm infants. A systematic literature search was conducted using PubMed, Scopus, CINAHL, Web of Science, Embase, and Google Scholar for studies published between January 2015 and March 2025. Eligible studies included cohort studies, case-control studies, randomized controlled trials, longitudinal investigations, and systematic reviews evaluating associations between maternal social determinants and developmental outcomes in preterm infants. Evidence indicates that socioeconomic disadvantage is consistently associated with poorer cognitive performance, delayed language development, impaired executive functioning, lower breastfeeding rates, suboptimal nutrition, slower catch-up growth, and reduced access to developmental interventions. Racial disparities are strongly influenced by structural inequities, healthcare accessibility, maternal stress, discrimination, environmental exposures, and differences in post-discharge support rather than intrinsic biological differences. Early developmental interventions, family-centered neonatal care, lactation support, culturally responsive healthcare, and comprehensive follow-up programs substantially improve developmental trajectories. These findings emphasize that addressing health inequities is essential for optimizing outcomes among preterm infants. Neonatal nurses play a pivotal role in identifying social risk factors, supporting families, promoting equitable care, and coordinating multidisciplinary interventions that improve neurodevelopment, feeding success, and growth.

Keywords: Preterm infant; Maternal race; Socioeconomic status; Neurodevelopment; Feeding outcomes; Growth; Neonatal nursing; Health disparities; Systematic review.

Introduction

Preterm birth, defined as birth before 37 completed weeks of gestation, affects approximately 13–15 million infants worldwide each year and remains one of the most significant contributors to neonatal mortality and long-term childhood disability. Improvements in obstetric management, antenatal corticosteroid therapy, neonatal resuscitation, respiratory support, nutritional care, and neonatal intensive care have markedly increased survival rates among very preterm and extremely preterm infants over the past three decades. Nevertheless, survival alone does not guarantee optimal health. Many preterm infants experience persistent neurodevelopmental impairment, feeding difficulties, poor physical growth, chronic respiratory disease, visual and hearing impairments, learning disabilities, and behavioral disorders extending into adolescence and adulthood. Neurodevelopment represents one of the most important long-term outcomes following preterm birth. Brain development accelerates during the final trimester of pregnancy, and interruption of intrauterine growth due to premature birth exposes the immature brain to inflammatory processes, hypoxia, oxidative stress, infection, nutritional deficiencies, and environmental challenges. Consequently, preterm infants demonstrate higher rates of cerebral palsy, cognitive delay, language impairment, executive dysfunction, attention-deficit disorders, autism spectrum disorders, and reduced academic achievement compared with term-born peers. Early childhood development depends not only on biological

maturation but also on environmental stimulation, parental interaction, nutritional adequacy, healthcare accessibility, and socioeconomic conditions. Feeding represents another major challenge among preterm infants. Oral feeding requires coordinated sucking, swallowing, and breathing, processes that are frequently immature in infants born prematurely. Prolonged tube feeding, delayed oral feeding initiation, gastrointestinal immaturity, and chronic medical complications often interfere with adequate nutritional intake. Breastfeeding provides substantial immunological, nutritional, and neurodevelopmental benefits for preterm infants, yet breastfeeding initiation and continuation vary significantly according to maternal education, income, race, social support, employment conditions, and healthcare practices. Feeding difficulties during infancy may contribute to growth failure, delayed neurological maturation, repeated hospitalization, and long-term nutritional deficiencies. Growth outcomes are equally important indicators of neonatal health. Appropriate postnatal growth supports organ maturation, brain development, immune function, and future metabolic health. Many preterm infants experience extrauterine growth restriction during hospitalization because of illness severity, delayed enteral feeding, inadequate protein intake, and feeding intolerance. Following hospital discharge, growth trajectories continue to be influenced by parental resources, food security, healthcare access, developmental services, and social support. Poor growth during infancy has been associated with impaired neurodevelopment, reduced school performance, increased susceptibility to chronic disease, and diminished quality of life. In recent years, researchers have increasingly recognized that biological factors alone cannot fully explain variations in neonatal outcomes. Social determinants of health including maternal education, household income, occupation, housing stability, neighborhood environment, health literacy, food security, insurance coverage, and access to healthcare substantially influence maternal and infant health. Maternal race is also associated with disparities in pregnancy outcomes and infant development; however, contemporary evidence suggests that these disparities are largely attributable to structural racism, differential access to healthcare, chronic psychosocial stress, environmental inequities, and socioeconomic disadvantage rather than innate biological differences. Understanding these relationships is essential for developing interventions that promote equitable neonatal care. Socioeconomic disadvantage influences health across the life course. Mothers living in poverty often experience limited access to high-quality prenatal care, nutritional deficiencies, housing instability, occupational stress, transportation barriers, and reduced availability of maternity leave. Such conditions increase the likelihood of pregnancy complications including hypertension, diabetes, infection, intrauterine growth restriction, and spontaneous preterm birth. After delivery, financial hardship may limit access to lactation support, developmental therapies, early intervention programs, and specialized neonatal follow-up clinics. Families with fewer economic resources also experience greater caregiving stress, which can affect parent–infant bonding and developmental stimulation.

Maternal education constitutes another important determinant of infant outcomes. Mothers with higher educational attainment generally demonstrate greater health literacy, increased utilization of preventive healthcare services, improved adherence to medical recommendations, and stronger engagement with developmental follow-up programs. Higher education is also associated with increased breastfeeding duration, enhanced responsiveness to infant developmental cues, and greater confidence in managing complex healthcare needs. Conversely, limited educational opportunities may reduce awareness of developmental milestones and delay recognition of developmental concerns requiring professional evaluation. The influence of maternal race on neonatal outcomes has received considerable attention internationally. Studies from North America, Europe, Australia, and other regions consistently report disparities in preterm birth rates, neonatal mortality, breastfeeding practices, developmental outcomes, and access to specialized care among racial and ethnic minority populations. These inequities reflect historical and contemporary structural inequalities that shape living conditions, healthcare experiences, environmental exposures, and psychosocial stress. Importantly, increasing evidence demonstrates that when healthcare access and socioeconomic conditions are comparable, many racial disparities diminish substantially, highlighting the importance of addressing systemic inequities rather than attributing differences solely to biological factors. The neonatal intensive care unit (NICU) provides an opportunity to reduce disparities through equitable, family-centered care. Modern neonatal nursing emphasizes developmental care, kangaroo mother care, family engagement, breastfeeding promotion, individualized nutritional support, pain management, and early developmental interventions. Nurses are uniquely positioned to identify families experiencing social vulnerability, facilitate referrals to community resources, provide culturally sensitive education, and advocate for equitable healthcare delivery. Family-integrated care models encourage parental participation in daily care activities and have demonstrated improvements in breastfeeding rates, infant growth, parental confidence, and neurodevelopmental outcomes. Despite increasing awareness of social determinants, considerable variation exists in how neonatal programs identify and address maternal socioeconomic disadvantage and racial inequities. Some healthcare systems routinely screen for social needs and provide multidisciplinary support, whereas others lack standardized assessment protocols or sufficient community resources. Consequently, opportunities to mitigate developmental risk may be missed, particularly among vulnerable populations. Given the expanding body of evidence linking maternal social determinants with neonatal outcomes, a comprehensive synthesis of current literature is warranted. This systematic review aims to evaluate the influence of maternal race and socioeconomic status on neurodevelopment, feeding, and growth outcomes among preterm infants and to identify evidence-based strategies that promote health equity. Particular emphasis is placed on the implications for neonatal nursing practice, multidisciplinary collaboration, and public health policy.

Review Objectives

The primary objective of this systematic review was to synthesize current evidence regarding the influence of maternal race and socioeconomic status on neurodevelopment, feeding, and growth outcomes among preterm infants. The specific objectives were to evaluate the relationship between maternal race and neurodevelopmental

outcomes; examine the impact of maternal socioeconomic status on feeding practices and postnatal growth; identify disparities in developmental follow-up and early intervention services; assess mechanisms linking social determinants with infant outcomes; evaluate evidence-based interventions that reduce inequities; and discuss implications for neonatal nursing practice, health policy, and future research.

Methodology

This systematic review was designed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework. The review sought to identify, critically appraise, and synthesize published evidence examining associations between maternal race, socioeconomic status, and neurodevelopmental, feeding, and growth outcomes among preterm infants. A comprehensive electronic literature search was performed in PubMed/MEDLINE, Scopus, Web of Science, Embase, CINAHL, and Google Scholar. The search covered studies published from January 2015 to March 2025 to capture contemporary evidence reflecting advances in neonatal intensive care and developmental follow-up. Search terms combined controlled vocabulary and free-text keywords, including *preterm infant*, *premature infant*, *maternal race*, *ethnicity*, *socioeconomic status*, *social determinants of health*, *neurodevelopment*, *feeding*, *breastfeeding*, *growth*, *developmental outcomes*, *NICU*, and *early intervention*. Boolean operators (AND/OR) and database-specific filters were applied to maximize sensitivity and specificity. Studies were eligible if they included preterm infants (<37 weeks' gestation), examined maternal race and/or socioeconomic status as exposures, and reported at least one outcome related to neurodevelopment, feeding, or physical growth. Randomized controlled trials, prospective and retrospective cohort studies, case-control studies, longitudinal investigations, mixed-methods studies, and systematic reviews published in English were included. Editorials, conference abstracts, opinion papers, and studies without relevant outcome measures were excluded. Titles and abstracts identified through the search were screened independently, followed by full-text assessment of potentially eligible articles. Data extracted included study characteristics, country, design, sample size, gestational age, maternal demographic variables, socioeconomic indicators, developmental outcomes, feeding outcomes, growth measures, and principal findings. Methodological quality was evaluated using standardized critical appraisal tools appropriate to study design, and findings were synthesized narratively because of heterogeneity in populations, outcome measures, and assessment methods.

Results

The database search identified a substantial body of literature examining the relationship between maternal race, socioeconomic status (SES), and developmental outcomes among preterm infants. Following removal of duplicate records and screening of titles, abstracts, and full-text articles according to the eligibility criteria, studies that specifically evaluated neurodevelopment, feeding, or postnatal growth outcomes in relation to maternal social determinants were included for narrative synthesis. The selected studies represented diverse geographic regions, including North America, Europe, Australia, Asia, Latin America, and selected low- and middle-income countries (LMICs). Most investigations employed prospective cohort, retrospective cohort, longitudinal, or population-based designs, with several systematic reviews and meta-analyses providing high-level evidence. Despite differences in study populations, outcome measures, and follow-up periods, the overall evidence consistently demonstrated that maternal socioeconomic disadvantage and structural racial inequities were associated with poorer developmental outcomes among preterm infants.

Maternal Race and Neurodevelopmental Outcomes

Neurodevelopmental impairment remains one of the most significant long-term consequences of preterm birth. Across the reviewed studies, infants born to mothers from historically marginalized racial and ethnic groups exhibited higher rates of developmental delay, lower cognitive scores, poorer language acquisition, and increased behavioral difficulties during infancy and early childhood. However, most investigators emphasized that these disparities were not attributable to biological differences associated with race itself. Rather, race functioned as a marker of exposure to broader social and structural inequities, including poverty, residential segregation, environmental hazards, discrimination, unequal educational opportunities, and limited access to high-quality healthcare. Several longitudinal cohort studies demonstrated that Black, Indigenous, and certain minority ethnic populations experienced higher rates of adverse neurodevelopmental outcomes following preterm birth compared with majority populations. Differences were particularly evident in cognitive performance, expressive and receptive language development, executive functioning, and school readiness. Nevertheless, statistical adjustment for maternal education, household income, neighborhood deprivation, health insurance status, and neonatal care quality substantially reduced these disparities in many studies, highlighting the dominant influence of social determinants rather than race alone. Chronic maternal stress emerged as a major mechanism linking racial inequities to infant neurodevelopment. Women exposed to persistent psychosocial stress related to discrimination, financial insecurity, unsafe housing, and inadequate social support demonstrated increased rates of preterm birth and pregnancy complications. Elevated maternal cortisol levels, inflammatory pathways, and altered placental function may adversely influence fetal brain development before birth. Following delivery, continued exposure to stressful environments may affect caregiving capacity, parent-infant interaction, and developmental stimulation, thereby contributing to poorer neurodevelopmental trajectories. The literature further indicated that access to developmental follow-up services differed across racial groups. Families from minority communities were less likely to attend scheduled neurodevelopmental assessments, early intervention programs, speech therapy, occupational therapy, and physiotherapy because of transportation barriers, financial constraints, work

obligations, language differences, and limited awareness of available services. Consequently, developmental delays were often identified later, reducing opportunities for timely intervention.

Influence of Maternal Socioeconomic Status on Neurodevelopment

Maternal socioeconomic status was consistently identified as one of the strongest predictors of developmental outcomes among preterm infants. Socioeconomic indicators examined across studies included maternal education, household income, employment status, neighborhood deprivation, housing conditions, health insurance coverage, and food security.

Infants born to mothers with lower educational attainment demonstrated significantly lower cognitive, language, and motor scores during infancy and preschool years compared with infants of mothers who had completed higher education. Maternal education influences developmental outcomes through multiple pathways, including health literacy, understanding of infant developmental needs, utilization of preventive healthcare, breastfeeding knowledge, and participation in developmental stimulation activities. Higher educational attainment was associated with increased reading to children, greater responsiveness during parent–child interactions, improved adherence to medical recommendations, and stronger engagement with early intervention programs. Household income also exerted substantial influence on infant development. Financial hardship limited families' ability to obtain nutritious food, transportation for follow-up appointments, developmental toys, educational materials, and specialized therapies. Several studies reported that poverty was independently associated with delayed cognitive development even after adjustment for gestational age, birth weight, neonatal illness severity, and maternal age. Children raised in economically disadvantaged households experienced cumulative exposure to multiple developmental risk factors, including overcrowded housing, environmental pollutants, caregiver stress, and reduced educational opportunities. Neighborhood deprivation contributed additional risk. Families residing in communities characterized by limited healthcare resources, inadequate childcare services, poor educational infrastructure, and unsafe recreational environments demonstrated poorer developmental outcomes than families living in more advantaged neighborhoods. These findings support ecological models of child development, emphasizing the interaction between biological vulnerability and environmental influences.

Feeding Outcomes and Breastfeeding Disparities

Feeding difficulties were among the most frequently reported complications experienced by preterm infants. Successful feeding requires coordinated neurological maturation, respiratory stability, gastrointestinal function, and caregiver support. The review identified significant disparities in feeding outcomes associated with maternal race and socioeconomic status. Breastfeeding initiation and continuation varied considerably across social groups. Mothers with higher educational attainment and greater financial resources consistently demonstrated higher rates of exclusive breastfeeding at hospital discharge and during the first six months of life. Access to lactation consultants, family support, paid maternity leave, and breastfeeding-friendly workplace policies contributed to these favorable outcomes. Conversely, mothers experiencing socioeconomic disadvantage frequently encountered barriers including early return to work, transportation challenges, inadequate breast pump access, food insecurity, limited lactation counseling, and insufficient family support. These barriers reduced breastfeeding duration despite strong maternal intentions. Racial disparities in breastfeeding were similarly observed. Minority women often reported receiving less breastfeeding education, lower levels of encouragement from healthcare professionals, fewer culturally appropriate educational resources, and reduced access to community lactation services. Historical inequities and mistrust of healthcare systems also influenced breastfeeding experiences in certain populations. Because human milk provides essential nutrients, immunological protection, growth factors, and bioactive compounds critical for premature brain development, disparities in breastfeeding contribute directly to differences in neurodevelopmental outcomes. Studies consistently demonstrated that exclusive human milk feeding improved cognitive development, reduced necrotizing enterocolitis, enhanced gastrointestinal maturation, and supported healthier growth among preterm infants.

Nurse-led breastfeeding promotion programs demonstrated significant effectiveness in improving feeding outcomes across diverse populations. Family-centered education, kangaroo mother care, individualized lactation counseling, donor human milk programs, and multidisciplinary feeding teams increased breastfeeding initiation and continuation while reducing parental anxiety.

Socioeconomic Influences on Physical Growth

Growth during infancy is a sensitive indicator of nutritional adequacy, medical stability, and developmental progress. The reviewed literature consistently demonstrated that socioeconomic disadvantage adversely affected weight gain, linear growth, head circumference growth, and catch-up growth among preterm infants. Infants from lower-income households experienced slower post-discharge weight gain, increased rates of growth restriction, and delayed catch-up growth compared with infants from economically advantaged families. These differences persisted even after adjustment for gestational age and birth weight in several longitudinal investigations. Food insecurity emerged as an important determinant of infant nutrition. Families experiencing financial hardship reported difficulties obtaining recommended infant formulas, nutritional supplements, and healthy complementary foods following discharge from neonatal intensive care. Limited financial resources also affected attendance at nutrition clinics and pediatric follow-up appointments. Maternal education influenced growth through improved nutritional knowledge and adherence to feeding recommendations. Mothers with greater health literacy were more likely to recognize feeding difficulties, monitor infant growth appropriately, and seek medical care when concerns arose. In contrast, reduced access to health education contributed to delayed recognition of growth faltering. The review also found that growth outcomes were influenced by healthcare accessibility. Regular

developmental surveillance, nutritional assessment, and multidisciplinary follow-up facilitated early identification of growth concerns and implementation of individualized nutritional interventions. Families with limited access to specialized neonatal follow-up services frequently experienced delayed intervention, increasing the likelihood of persistent growth deficits.

Biological and Social Mechanisms Linking Maternal Characteristics to Infant Outcomes

The reviewed evidence suggests that maternal race and socioeconomic status influence preterm infant outcomes through interconnected biological, behavioral, environmental, and healthcare mechanisms. Maternal chronic stress associated with poverty, discrimination, and financial insecurity activates neuroendocrine and inflammatory pathways that may impair placental function and fetal development. Inadequate maternal nutrition, higher rates of pregnancy complications, reduced prenatal care utilization, and increased exposure to environmental pollutants further contribute to adverse neonatal outcomes. Following birth, the home environment becomes a major determinant of development. Caregiver responsiveness, language exposure, nutritional adequacy, emotional security, and opportunities for play and learning strongly influence neurodevelopmental trajectories. Socioeconomic disadvantage may limit access to these protective factors while simultaneously increasing exposure to adverse childhood experiences. Importantly, several studies emphasized that many disparities were modifiable through healthcare interventions. Early developmental therapies, nutritional counseling, breastfeeding support, family-centered neonatal care, social work services, home visiting programs, and coordinated multidisciplinary follow-up substantially improved developmental outcomes among socially vulnerable families.

Evidence from High-Income Countries and Low- and Middle-Income Countries

Marked differences were observed between studies conducted in high-income countries (HICs) and low- and middle-income countries (LMICs). Healthcare systems in HICs generally provided greater access to neonatal intensive care, developmental surveillance, rehabilitation services, lactation consultants, and multidisciplinary follow-up clinics. Although disparities persisted within these countries, the overall availability of specialized services supported improved outcomes. In contrast, studies from LMICs described significant challenges related to limited neonatal resources, shortages of developmental specialists, inadequate nutritional support, transportation barriers, and inconsistent post-discharge follow-up. Poverty, food insecurity, and restricted healthcare access amplified the biological vulnerabilities associated with prematurity. Nevertheless, community-based interventions, kangaroo mother care, breastfeeding promotion initiatives, and nurse-led family education demonstrated meaningful improvements even in resource-constrained settings.

Across all healthcare settings, the evidence indicated that reducing social inequities through comprehensive family support, equitable healthcare access, culturally responsive services, and early developmental intervention has the potential to substantially improve neurodevelopment, feeding success, and physical growth among preterm infants.

Discussion

This systematic review synthesized current evidence regarding the influence of maternal race and socioeconomic status (SES) on neurodevelopmental, feeding, and growth outcomes among preterm infants. The findings consistently demonstrate that while biological immaturity associated with preterm birth remains a primary determinant of neonatal vulnerability, social determinants of health substantially influence developmental trajectories during infancy and early childhood. Across diverse healthcare systems and populations, socioeconomic disadvantage and structural inequities were associated with poorer cognitive development, delayed language acquisition, reduced breastfeeding rates, impaired postnatal growth, and diminished access to specialized healthcare services. These findings reinforce the growing consensus that optimizing outcomes for preterm infants requires not only advances in neonatal intensive care but also comprehensive strategies addressing the social conditions in which children are born and raised. One of the strongest findings of this review is that maternal socioeconomic status independently predicts neurodevelopmental outcomes even after adjustment for gestational age, birth weight, neonatal complications, and maternal age. Infants from economically disadvantaged households consistently demonstrated lower cognitive scores, delayed language development, poorer executive functioning, and reduced school readiness compared with infants from higher-income families. These disparities likely arise from cumulative exposure to multiple environmental stressors, including financial insecurity, caregiver stress, reduced educational opportunities, food insecurity, and limited access to developmental resources. The interaction between biological vulnerability and adverse social environments creates a cycle of developmental disadvantage that may persist throughout childhood.

The review also highlights the importance of maternal education as a protective factor. Mothers with higher educational attainment generally demonstrated greater health literacy, increased utilization of preventive healthcare, improved adherence to nutritional recommendations, and stronger participation in developmental follow-up programs. These findings support ecological models of child development, which recognize that infant outcomes are shaped by continuous interactions among biological, family, community, and societal factors. Educational interventions that enhance parental knowledge and confidence may therefore represent effective strategies for improving developmental outcomes among preterm infants.

A critical observation emerging from this review concerns the interpretation of racial disparities. Earlier research often attributed differences in neonatal outcomes directly to race; however, contemporary evidence increasingly recognizes race as a social construct that reflects exposure to structural inequities rather than inherent biological differences. Chronic psychosocial stress related to discrimination, unequal access to healthcare, residential

segregation, environmental hazards, and economic disadvantage contributes substantially to adverse pregnancy outcomes and infant development. Importantly, several studies demonstrated that racial disparities were markedly reduced after adjustment for socioeconomic variables and healthcare access, emphasizing the need to address structural determinants rather than focusing solely on race. Feeding outcomes represented another important domain affected by maternal social determinants. Breastfeeding provides well-established nutritional, immunological, and neurodevelopmental benefits for premature infants. Nevertheless, substantial disparities in breastfeeding initiation, exclusivity, and duration were consistently reported across socioeconomic and racial groups. Mothers with limited financial resources often experienced barriers related to transportation, inadequate maternity leave, employment obligations, lack of lactation support, and restricted access to breast pumps. Minority mothers additionally reported lower levels of culturally appropriate breastfeeding education and support. Because exclusive human milk feeding is associated with improved brain development, gastrointestinal maturation, and reduced neonatal morbidity, addressing inequities in breastfeeding support represents an important public health priority. Growth outcomes similarly reflected the influence of socioeconomic conditions. While advances in neonatal nutrition have improved growth during hospitalization, post-discharge growth remains strongly influenced by family resources, food security, healthcare accessibility, and parental education. Families experiencing poverty frequently encountered challenges obtaining specialized infant formula, nutritional supplements, transportation to follow-up clinics, and developmental services. Consequently, preterm infants from disadvantaged households experienced slower catch-up growth and greater risk of persistent growth restriction. These findings highlight the importance of integrating nutritional counseling, social support, and routine growth monitoring into neonatal follow-up programs. The review also demonstrated considerable differences between high-income countries and low- and middle-income countries (LMICs). High-income settings generally provided greater access to neonatal intensive care, multidisciplinary developmental follow-up, lactation services, occupational therapy, physiotherapy, and speech-language pathology. Although socioeconomic disparities remained evident within these countries, healthcare infrastructure partially mitigated developmental risk. In contrast, many LMICs experienced shortages of neonatal specialists, developmental therapists, nutritionists, and community rehabilitation services. Financial barriers, transportation difficulties, and limited health insurance further restricted access to long-term follow-up. Despite these challenges, community-based interventions, kangaroo mother care, breastfeeding promotion, and nurse-led family education demonstrated encouraging improvements even within resource-constrained settings. Another important finding concerns the effectiveness of early intervention programs. Across multiple studies, infants receiving multidisciplinary developmental surveillance, physiotherapy, occupational therapy, speech-language intervention, nutritional counseling, and family-centered education achieved superior developmental outcomes compared with infants receiving standard follow-up. Early identification of developmental delays allows intervention during periods of maximal brain plasticity, thereby improving cognitive, motor, and behavioral outcomes. These findings underscore the importance of ensuring equitable access to developmental services regardless of socioeconomic status or geographic location. The evidence synthesized in this review has important implications for neonatal nursing practice. Nurses are uniquely positioned to identify social vulnerabilities during hospitalization and after discharge. Routine assessment of maternal education, financial challenges, housing stability, food insecurity, transportation access, and caregiver stress enables early identification of families requiring additional support. Integrating standardized social determinant screening into neonatal care pathways may facilitate timely referral to social workers, lactation consultants, nutritionists, developmental specialists, and community resources.

Clinical Implications for Neonatal Nursing

Neonatal nurses occupy a central position in promoting equitable developmental outcomes among preterm infants. Because nurses provide continuous bedside care and maintain close relationships with families, they are well placed to recognize social, emotional, nutritional, and educational challenges that may affect infant health. Comprehensive nursing assessments should therefore extend beyond physiological monitoring to include evaluation of family circumstances, health literacy, caregiving capacity, and barriers to healthcare access. Family-integrated care should be considered a core nursing strategy. Encouraging parental participation in feeding, skin-to-skin care, developmental stimulation, and decision-making enhances parent–infant attachment while improving breastfeeding success and neurodevelopmental outcomes. Nurses should provide culturally responsive education tailored to the family's language, literacy level, and cultural beliefs to ensure that health information is understandable and applicable. Discharge planning represents another critical nursing responsibility. Coordination of follow-up appointments, referral to early intervention services, nutritional counseling, community health programs, and psychosocial support helps ensure continuity of care after NICU discharge. Telehealth follow-up, where available, may reduce disparities among families living in remote or underserved areas. Finally, neonatal nurses play an essential advocacy role by promoting policies that improve equitable access to prenatal care, breastfeeding support, developmental assessment, and multidisciplinary follow-up services. Nursing leadership can contribute to quality improvement initiatives aimed at reducing healthcare disparities and strengthening family-centered neonatal care.

Strengths and Limitations

This systematic review provides a comprehensive synthesis of contemporary evidence examining maternal race, socioeconomic status, and developmental outcomes among preterm infants. Inclusion of studies from multiple countries and healthcare settings enhances the generalizability of findings and allows comparison of disparities across diverse populations. The review also integrates evidence related to neurodevelopment, feeding, and physical growth, providing a holistic understanding of infant development. Several limitations should be

acknowledged. Considerable heterogeneity existed in study design, socioeconomic indicators, developmental assessment tools, and follow-up duration, limiting opportunities for quantitative meta-analysis. Most included studies originated from high-income countries, reducing representation of low-resource settings where the burden of preterm birth is greatest. Publication bias and language restrictions may also have influenced study selection. Finally, observational studies cannot establish definitive causal relationships between social determinants and developmental outcomes because of potential residual confounding.

Recommendations

Future research should prioritize longitudinal investigations evaluating mechanisms through which socioeconomic adversity influences brain development and long-term functional outcomes. Greater representation of low- and middle-income countries is necessary to improve understanding of context-specific challenges and effective interventions. Standardization of developmental assessment methods would facilitate comparison across studies and strengthen evidence synthesis. Healthcare systems should implement routine screening for social determinants of health during pregnancy, NICU hospitalization, and post-discharge follow-up. Expansion of multidisciplinary developmental programs, lactation support, nutritional services, home-visiting initiatives, and telehealth-based developmental monitoring may reduce inequities among vulnerable populations. Policies supporting paid parental leave, food security, transportation assistance, and universal access to neonatal follow-up services are likely to improve developmental outcomes. Educational programs for neonatal nurses should strengthen competencies related to health equity, culturally responsive communication, trauma-informed care, family-centered practice, and developmental surveillance. Collaborative partnerships among hospitals, public health agencies, and community organizations are essential for addressing the broader social determinants influencing preterm infant health.

Conclusion

This systematic review demonstrates that maternal race and socioeconomic status are significant determinants of neurodevelopment, feeding success, and growth among preterm infants, largely through the influence of structural and social factors rather than inherent biological differences. Socioeconomic disadvantage, limited healthcare access, food insecurity, reduced breastfeeding support, chronic psychosocial stress, and inadequate developmental follow-up contribute to disparities in infant outcomes across healthcare settings. Conversely, equitable access to comprehensive neonatal care, early developmental intervention, family-centered support, and culturally responsive nursing practices can substantially improve developmental trajectories. Improving outcomes for preterm infants therefore requires an integrated approach combining excellence in neonatal intensive care with sustained efforts to address social inequities. Neonatal nurses, working collaboratively within multidisciplinary teams, are instrumental in identifying vulnerable families, coordinating supportive services, promoting breastfeeding and developmental care, and advocating for equitable healthcare policies. Continued investment in evidence-based neonatal nursing practice, social support programs, and public health initiatives is essential to ensure that every preterm infant has the opportunity to achieve optimal growth, neurodevelopment, and lifelong health, regardless of maternal race or socioeconomic background.

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