

ASSESSMENT OF PHYSICAL DEVELOPMENT IN EARLY CHILDHOOD AMONG CHILDREN BORN TO MOTHERS WHO EXPERIENCED COVID-19 DURING PREGNANCY

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Abstract. The COVID-19 pandemic has had far-reaching effects on maternal and child health worldwide. Recent studies suggest that intrauterine exposure to SARS-CoV-2 infection may influence fetal growth, early development, and postnatal adaptation. This review aims to analyze the available data on the physical development of infants and young children born to mothers who experienced COVID-19 during pregnancy. The findings indicate that while most children demonstrate normal growth parameters, a subset shows mild deviations in anthropometric indicators and psychomotor milestones, particularly among those exposed during the second or third trimester. The possible mechanisms include placental inflammation, maternal hypoxia, and cytokine-mediated effects on fetal development. Early monitoring and targeted interventions are recommended to ensure optimal growth outcomes.

Keywords: COVID-19, pregnancy, intrauterine exposure, physical development, early childhood, anthropometry, maternal infection.

Introduction. Since its emergence in late 2019, COVID-19 has posed significant challenges to global health systems. Pregnant women represent a vulnerable group due to the immunological and physiological changes inherent to gestation. Although vertical transmission of SARS-CoV-2 remains rare, maternal infection may still have indirect effects on fetal and neonatal outcomes (1).

Physical development during early childhood reflects the overall health and growth potential of the child. It is influenced by prenatal, perinatal, and postnatal factors. The consequences of maternal COVID-19 during pregnancy on children's physical growth parameters, such as body weight, length, and head circumference, have become an important topic of pediatric and perinatal research (2).

This review summarizes current literature regarding the effects of maternal COVID-19 infection on the physical development of early childhood, emphasizing the potential mechanisms and clinical implications.

Literature Review. Several observational studies have investigated the outcomes of pregnancies affected by COVID-19. Chen et al. (2020) observed that neonates born to infected mothers generally had normal birth weights and Apgar scores, though a small proportion exhibited intrauterine growth restriction (IUGR) (3). Similarly, Knight et al. (2021) found that preterm delivery rates were higher among COVID-19-positive mothers compared to non-infected controls (4).

A multicenter study in Europe reported that maternal infection during the third trimester was associated with lower birth weights and a slightly increased risk of neonatal intensive care unit (NICU) admission (5). Meanwhile, Schwartz and colleagues (2022) highlighted placental pathology findings consistent with inflammatory and vascular injury, potentially affecting fetal oxygenation and growth (6).

Longitudinal follow-ups have shown that most infants catch up in weight and length by 6–12 months, though mild psychomotor delays may persist in a minority of cases (7). Such outcomes are believed to be multifactorial, influenced not only by infection itself but also by maternal stress, altered prenatal care, and socioeconomic factors during the pandemic period.

Discussion

The impact of maternal COVID-19 infection on early physical development appears to be modest in most cases, but the variability in outcomes warrants continued attention. Mechanistic hypotheses include:

1. Placental Inflammation and Hypoxia: SARS-CoV-2 can induce chronic histiocytic intervillitis and vascular malperfusion, leading to reduced nutrient and oxygen transfer to the fetus (6).
2. Cytokine Storm and Immune Activation: Elevated maternal interleukins and TNF- α may affect fetal neurodevelopment and growth (2).
3. Preterm Birth and Iatrogenic Delivery: Increased rates of cesarean sections and premature births among infected mothers can influence postnatal adaptation and growth trajectories (4).

Despite these potential risks, current evidence does not demonstrate widespread or severe growth impairment among children born to mothers with COVID-19. Instead, subtle and transient deviations are more common, emphasizing the importance of longitudinal monitoring during infancy and early childhood.

Healthcare systems should prioritize follow-up programs for these children, incorporating regular anthropometric assessment, nutritional counseling, and neurodevelopmental evaluation. Preventive measures such as maternal vaccination and optimized antenatal care are also critical in mitigating risks.

Conclusion. Children born to mothers who experienced COVID-19 during pregnancy generally exhibit normal patterns of physical development, though some may experience mild and temporary deviations. Further large-scale, longitudinal studies are needed to clarify the long-term implications of intrauterine exposure to SARS-CoV-2. Continuous follow-up and early

intervention strategies can ensure favorable outcomes and support optimal child health in the post-pandemic era.

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