

STRONG CHILDREN'S RESEARCH CENTER

Summer Research Scholar

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ABSTRACT

Title: Impact of Vitamin D Supplementation During Pregnancy on Childhood Respiratory Infections

Background: Lower respiratory infections (LRI) are the leading cause of morbidity and mortality around the world¹⁰. LRIs account for over 2.3 million deaths annually, making it the 6th leading cause of death at all ages and the leading cause of death in children⁸. While improved treatment options and increased access to care are decreasing the rates of LRI mortality in the pediatric population, LRIs such as pneumonia and bronchiolitis are associated with additional long-term risks such as asthma^{10,2,5}.

Upper respiratory infections (URI) generally do not cause as severe disease as LRIs, but are one of the most common infections seen in children. There are over 200 known viruses that can cause URIs, and these infections can exacerbate disease such as asthma⁹. Many of the same viruses that cause URIs can also cause LRIs. One example is Respiratory Syncytial Virus (RSV), which is a common cause of hospitalization due to bronchiolitis, pneumonia, and tracheobronchitis in young children³. Wheezing caused by RSV has also been linked to increased rates of childhood asthma⁴. Decreasing the rates of respiratory infections during childhood could help minimize the number of children who develop asthma.

Studies have shown that vitamin D contributes to the development of the immune and respiratory systems in *utero*^{7,1}. Similarly, decreased cord-serum vitamin D has also been linked to increased rates of respiratory infections within the first 6 months of life⁶. To help combat the impact that respiratory infections have on children and their families, we examined how prenatal maternal vitamin D supplementation impacted the risk of developing respiratory infections early in childhood.

Methods: Data from the Vitamin D Antenatal Asthma Reduction Trial (VDAART) was analyzed using RStudio. Vitamin D was measured in blood samples from pregnant mothers. Samples were taken at the 1st trimester (Baseline), 3rd trimester, and cord blood. Logistic and Poisson regression analysis were used to evaluate the rate and likelihood of developing colds, lower, and upper respiratory infections. The multivariable analysis adjusted for income, race, maternal education, location, sex of child, maternal asthma status and paternal asthma status.

Results: Upper, lower, and total respiratory infections (RI) in general showed significant correlation with the development of asthma or wheeze by age 3 ($p < 2.2 \times 10^{-16}$, 8×10^{-5} , and 3.9×10^{-8}). Poisson analysis showed that the control group, developed more LRIs (RR = 1.25, 95% CI: 1.04–1.49, $p = 0.015$) and RIs (RR = 1.09, 95% CI: 1.00–1.18, $p = 0.038$) compared to the treatment group. There was no significant difference in the number of URIs (RR = 1.07, 95% CI: 0.97–1.17, $p = 0.157$) or colds (RR = 0.99, 95% CI: 0.95–1.03, $p = 0.563$). Logistic analysis of baseline vitamin D did not have a significant impact on development of LRIs (OR = 1.00, 95% CI: 0.98–1.02, $p = 0.885$), URIs (OR = 1.01, 95% CI: 0.99–1.03, $p = 0.177$), RIs (OR = 1.01, 95% CI: 0.99–1.03, $p = 0.529$), or colds (OR = 0.99, 95% CI: 0.98–1.01, $p = 0.358$). Similarly, 3rd trimester vitamin D did not show a significant impact on development of LRIs (OR = 1.00, 95% CI: 0.99–1.01, $p = 0.758$), URIs (OR = 1.00, 95% CI: 0.99–1.01, $p = 0.617$), RIs (OR = 1.00, 95% CI: 0.99–1.02, $p = 0.662$), or colds (OR = 1.00, 95% CI: 0.98–1.01, $p = 0.464$). Increased cord blood vitamin D was not significant for the prevention of LRIs (OR = .00, 95% CI: 0.99–1.01, $p = 0.742$) or colds (OR = 1.00, 95% CI: 0.99–1.01, $p = 0.530$), but was significant for prevention of URIs (OR = 0.98, 95% CI: 0.97–1.00, $p = 0.012$) and RIs (OR = 0.98, 95% CI: 0.97–1.00, $p = 0.017$)

Conclusion: Analysis showed that supplementation with vitamin D during pregnancy was associated with decreased number of lower respiratory infections and total respiratory infections overall in children at 3 years of age as compared to control patients. The data also showed that higher vitamin D levels in cord blood was associated with decreased likelihoods of developing an upper respiratory infection and a respiratory infection in general by the age of 3.

Citations:

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