ABSTRACT

Vitamin D is a lipid soluble vitamin that acts as a hormone as well as a micronutrient. Through vitamin D receptors (VDR) expressed on immune cells, vitamin D polarizes Th1/Th2 cytokine balance in pregnancy regulating humoral immune responses triggered by B cell antigens. How plasma concentrations of 25-hydroxyvitamin D affect the quantity of anti-measles virus and anti-diphtheria toxoid vaccine-antigen antibodies during pregnancy in early life years remain unclear. This study assumed that vitamin D affects antibody responses to infections and therefore investigated its association with IgG levels following measles virus and diphtheria toxoid vaccination during childhood. Specifically, the study quantified plasma concentrations of 25 (OH) D, anti measles virus and anti diphtheria toxoid IgG, and computed the association between 25(OH) D and the vaccine-induced IgG responses in mother-child pairs. This was a hospital-based prospective cohort study of pregnant mothers from their first trimester to delivery; and mother-infant pairs from delivery/birth up to 18 months old. Mothers attending antenatal care at Chulaimbo Sub-County hospital were enrolled in their first trimester and followed up to delivery. Infants were followed up from delivery to 18 months old at 6 months interval. Plasma was freshly processed from the blood samples, and stored at -80^{o}C before bio-assaying. Plasma concentration of 25(OH) D was measured by enzyme immuno-sorbent assay technique (EIA) *in vivo* at ANC1,2,3 and 4/delivery in mothers; in cord blood, at 6, 12 and 18 months in children. Anti-measles virus and anti-diphtheria toxoid vaccine IgG antibody levels were quantified using commercially available ELISA kits at delivery in mothers; in cord blood, at 6, 12 and 18 months in children. Data was analysed from 47 mother-child pairs. Vitamin D quantifications showed that, at delivery, 8.51% (4) of the mothers were deficient (<25nmol/L), 27.66% (13) insufficient (<50nmol/L) and 63.83 % (30) were sufficient (≥75nmol/L). At delivery, 6, 12 and 18 months, 27.66% (13), 10.64% (5), 12.77% (6) and 10.64% (5) infants were deficient and 17.02% (8), 25.53% (10) and 21.28% (10) infants were insufficient respectively. Vaccine-induced IgG antibody profile data showed that, 10.64% (5) of the mothers at delivery; 19.15% (9), 57.15% (27), 4.26% (2), 2.13% (1) infants had low(≤ 0.5) anti-measles virus vaccine-induced IgG levels; 65.96% (31) mothers and their infants, 36.17% (17), 53.19% (25) and 46.81% (22) infants had low(≤ 1.6) anti-diphtheria toxoid vaccine-induced IgG levels at delivery and subsequent follow up time points. Maternal plasma 25(OH) D concentrations were correlated with infants' anti-measles virus (r^2=0.71) and anti-diphtheria toxoid (r^2=0.56) vaccine-induced IgG antibody levels at delivery. These findings add knowledge about vitamin D status and anti measles virus and anti-diphtheria vaccine-antigen IgG antibody responses. Pregnant women and their infants from regions with constant sunny climatic conditions have varying vitamin D status including; deficient (<50nmol/L), insufficient (≥50<75nmol/L) and sufficient (≥75nmol/L) status. Similarly, proportions of these participants depict high, medium and low vaccine-induced IgG antibody responses with regards to the respective vaccine standard references. Maternal vitamin D status is associated with the infant's vitamin D status early in life, besides, maternal vitamin D concentrations at delivery are associated with the infant's vaccine-induced IgG antibody levels at birth, thus influencing the child's passive immunity. This study therefore recommends maintenance of adequate maternal plasma vitamin D concentrations for sufficient infant plasma vitamin D levels at birth and optimum vaccine-induced IgG responses in their infants in early life years.