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Vitamin D in Pregnant Women Affect by Covid-19

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Abstract

Vitamin D can modulate immune responses, and its deficiency is linked to increased autoimmunity and susceptibility to infection. The role of vitamin D in pregnant women with COVID-19 has been poorly investigated to date. The aim of this study was to evaluate the influence of vitamin D in affecting some clinical features in pregnancy between SARS-CoV-2 positive and negative patients. Vitamin D deficiency tends to be common in pregnant women who have COVID-19, and the level of this vitamin has been demonstrated to have a strong correlation with the severity of the illness. As vitamin D serum levels correlate with COVID-19 symptoms and even with its occurrence, appropriate vitamin D supplementation in the prenatal period is suggested.

Keywords: Vitamin D; COVID-19; SARS-CoV-2; Pregnancy\

Abbreviations: SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2; I: Interleukin L; TNF-α: Tumor Necrosis Factor-α; RNA: Ribonucleic Acid

Introduction

The global impact of the COVID-19 pandemic has been far-reaching, affecting a significant portion of the global population, and almost 6.9 million people have died because of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. A comprehensive analysis of risk groups revealed that pregnant women had a 70% higher prevalence of severe COVID-19 infection compared with a similar age group in the general population [2]. This susceptibility can be attributed to the physiological changes that occur during pregnancy, such as the suppression of the maternal immune system to safe guard the fetus from potential immune reactions until delivery, as well as anatomical adaptations such as the elevation of the diaphragm in response to the expanding uterus mucosal edema in the respiratory tract, and increased oxygen requirements [2,3]. Existing evidence suggests that COVID-19 infection may elevate the risk of adverse pregnancy outcomes [4,5].

Vitamin D deficiency (below 50 nM/L(20ng/mL) [6] is a global public health problem that commonly affects the elderly and those with comorbidities such as obesity, diabetes, hypertension, respiratory disorders, recurrent infections, immune deficiency, and malignancies, as well as ethnic minorities living in temperate countries [7,8]. Interestingly, the same groups known to be at risk of vitamin D deficiency were amongst the worst affected by COVID-19. Given the significance of the presented findings, it is crucial to investigate the impact of vitamin D serum levels on pregnant women affected by COVID-19.

Discussion

Pregnancy significantly increases the vulnerability of pregnant women to infectious diseases, especially COVID-19 infection. A case-control study conducted in Ankara of 491 pregnant women (159 cases and 332 controls) found that vitamin D levels were significantly lower in COVID-19 positive compared to negative pregnant women [9]. Another study in 35 pregnant women (20 healthy, 7 with asymptomatic infection and 8 with mild symptomatic infection) also found a significant relationship between vitamin D levels and COVID-19 infection, being significantly lower in those patients who had the infection compared to healthy pregnant women [10]. Although another study shows similar results [11], other investigation of 447 women (147 cases and 300 controls) in pregnant women, found no statistically significant differences between vitamin D and COVID-19 infection among its par-

ticipants, as having vitamin D deficiency/sufficiency was similar in both infected and healthy pregnant women [12].

We also found controversial results regarding gravity and vitamin D during COVID-19 infection in studies published in the literature. Tekin et al. also found no relationship between vitamin D levels and severity of COVID-19 infection [12]. However, in the case-control study of pregnant women in Ankara, although vitamin D levels were low in both the mildly and moderately/severely infected groups, significantly higher levels were observed in the mildly infected group [9].

Moreover, an interesting finding was made by Moreno-Fernandes et al., who showed the increased vitamin D serum level in the placental tissue of COVID-19 pregnant women [13]. To date, no other studies have explored this area. However, this finding suggests a potential direct impact on the fetus, which could contribute to adverse pregnancy and neonatal outcomes. Previous research has established a correlation between low vitamin D serum levels and the severity of placental disorders during pregnancy [14].

Vitamin D deficiency is associated with increased autoimmunity and an increased susceptibility to infection [15]. It is thought that adequate vitamin D levels (>30ng/dL) reduce the inflammatory response to SARS-CoV-2 by increasing anti-inflammatory cytokines such as interleukin-4 (IL-4) and IL-10 levels and decreasing the concentrations of pro-inflammatory cytokines such as IL-1β, tumor necrosis factor-α (TNF-α), IL-8, IL-12, and, especially, IL-6 [16,17]. In particular, vitamin D induces the conversion of monocytes to macrophages and influences the activity of dendritic, T, and B cells [18]. Vitamin D supplementation in SARS-CoV 2 infection could have a role in reducing the risk of severe COVID-19 disease in pregnant women [19].

There is a need for clinical trials that can support this relationship. In a clinical trial of 40 not pregnant individuals with COVID-19 infection, patients with vitamin D deficiency were randomized to receive 60000 IU daily cholecalciferol for seven days versus placebo in controls. Subsequently, vitamin D levels were assessed at seven days. Weekly supplementation of 60000 IU was provided to those with vitamin D levels above 50ng/ml, continuing with the same daily supplementation dose for another seven days in those participants whose levels were below that figure. It was observed that a high dose of oral vitamin D supplementation to increase levels above 50ng/ml helped achieve SARS-CoV-2 RNA negativity compared to vitamin D-deficient individuals. There was also a significant decrease in fibrinogen in the intervention group compared to placebo [20].

Conclusion

More studies of good quality are needed to draw adequate conclusions regarding the relationship between vitamin D levels and COVID-19 infection in the pregnant population.

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