



## ROLE OF VITAMIN D IN COVID VACCINE EFFICACY IN ELDERLY IN INDIAN POPULATION

**Dr. Gujjarlapudi Deepika\***

Senior Consultant & HOD, Department of Biochemistry, AIG Hospitals, Gachibowli, Hyderabad, Telangana, India. \*Corresponding Author

**Dr. Duvuru Nageshwar Reddy**

Chairman & Chief, Department of Gastroenterology, AIG Hospitals, Gachibowli, Hyderabad, Telangana, India.

**ABSTRACT** **Background:** Aim of this study is to summarise the role of Vitamin D in supporting the immune system, in covid vaccinated recipients. **Methods:** This is an observational study done between April 2021 to June 2021 in Indian population. We compared anti-SARS-CoV-2 spike RBD IgG antibody & anti-spike antibodies following vaccination of non-hospitalized participants along with vitamin D levels in recipients above 60 years. They were tested after vaccination after two doses between 15-45 days. Before study inclusion criteria is, we have checked whether they were as seropositive or seronegative based on nucleocapsid total antibody results. **Results** of 310 vaccine recipients, 46 reported a prior COVID-19 diagnosis and we have excluded them from the study of the 264 with no history of Covid-19, 70 were vitamin D deficient (50M;20 F) & 194 (130 M;64 F) were vitamin D Sufficient. Responses were evaluated after two doses on an average post-vaccine RBD IgG concentration and Spike antibodies were each significantly higher among the Vit D sufficient recipients compared to the vitamin D Deficient recipients. **Conclusions:** An integrated approach is required to better understand aging and how vaccines work in elderly which will help in improving the immune response in older adults after vaccination.

**KEYWORDS :** Vitamin D , Anti spike neutralising antibodies, RBD IgG antibodies, Covid vaccine efficacy

### INTRODUCTION:

Severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) vaccine candidates are being evaluated, with the goal of conferring immunity on the highest percentage of people who receive the vaccine as possible. Importantly vaccine efficacy, depends not only on the vaccine, but also on characteristics of the vaccinated. Recently researchers have highlighted nutrition as a possible factor influencing the effectiveness of the COVID-19 vaccine, establishes a link between vitamin D levels and an adequate immune response. Vitamin D receptors have been identified in most immune cells and some cells of the immune system can synthesise the active form of vitamin D from its precursor, suggesting that vitamin D is likely to have important immunoregulatory properties. Vitamin D is critical for bone and mineral metabolism. Because the vitamin D receptor is expressed on immune cells such as B cells, T cells, and antigen-presenting cells, and because these cells can synthesise the active vitamin D metabolite, vitamin D also has the potential to modulate innate and adaptive immune responses.<sup>(1)</sup> There are plethora of studies that have investigated factors that influence humoral and cellular vaccine responses in humans. These include intrinsic host factors, perinatal factors, extrinsic factors, environmental factors, behavioural factors, and nutritional factors also influence how individuals respond to vaccines. Moreover, vaccine factors and administration factors are also important. An understanding of all these factors and their impacts in the design of vaccine studies and decisions on vaccination schedules offers ways to improve vaccine immunogenicity and efficacy.<sup>(2)</sup> Factors influencing immunosenescence. Aging is influenced by multifaceted factors leading to a progressive impairment of immune responsiveness, leading to increased susceptibility to infectious diseases and to reduced response to vaccination.<sup>(3)</sup>

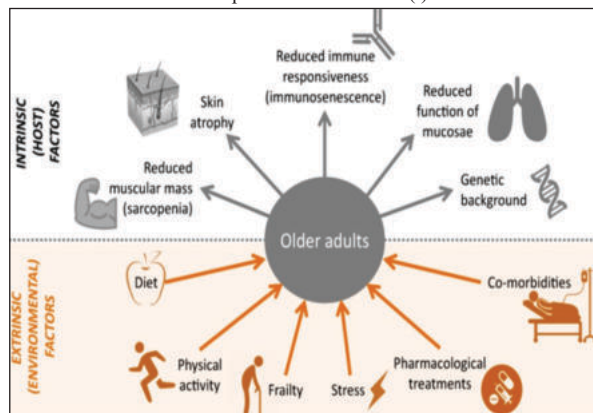


Figure-1 Aging Mechanism (2)

### MATERIALS AND METHODS:

This is a hospital based Retrospective study of 480 patients of IBD was done in Department of Biochemistry, Asian Institute of Gastroenterology, hospital Hyderabad in South India vaccinated either with Covisheild and Covaxin.. Ethical committee approval has been received and that the informed consent of all participating subjects was obtained.

### Specimen Collection And Processing:

A 4ml Venous blood sample were taken, centrifuged and serum was used for testing quantitative anti RBD IgG antibodies (Roche) by ECLIA, Total Antibodies against Nucleocapsid (Roche) ECLIA, anti-spike IgG S1/S2 (Diasorin) against SARS-COV-2 CLIA, Vitamin D estimation with ECLIA (Roche) from all Above 60 age group.

### Statistical Analysis :

SPSS program 19 version was used for the analysis of data. Data were presented as mean  $\pm$  SD. P-value < 0.05 was considered statistically significant.

### RESULTS:

In **study I** of 310 vaccine recipients, 46 reported a prior COVID-19 diagnosis and were seropositive COVID-19 by analysing by IgG positive by Nucleocapsid and we have excluded them from the study. of the 264 with no history of Covid-19, 70 were Vitamin D deficient (50M;20 F) and 194 (130 M;64 F) were Vitamin D sufficient. The mean age for Vitamin deficiency was  $67 \pm 5.4$  for male and  $66.5 \pm 4.7$  for female. The mean age for Vitamin sufficient was  $65 \pm 8.3$  for male and  $66 \pm 9.4$  for female.

**Table: 1 Demographic And Clinical Characteristics Of Study Population (N = 264)**

| PARAMETERS | N   | Vitamin D Deficient (Below 10 ng/ml) | Vitamin D sufficient (30-100 ng/ml) |
|------------|-----|--------------------------------------|-------------------------------------|
| Male       | 180 | 50 (71.4 %) ( $67 \pm 5.4$ )         | 130 (67.0 %) ( $65.5 \pm 8.3$ )     |
| Female     | 84  | 20 (28.4 %) ( $66.5 \pm 4.70$ )      | 64 (33.0 %) ( $66 \pm 9.4$ )        |

In **study II**. Responses were evaluated after two doses after 15-45 days anti spike antibodies mean post-vaccine RBD IgG concentration and anti spike S1/S2 were each significantly higher among the Vit D sufficient recipients (median Anti Spike  $112.4 \pm 66.7$  AU/ml, RBD IgG;  $2450 \pm 420$  U/ml) compared to the Vitamin D Deficient recipients ( $36.2 \pm 22.6$  AU/ml RBD IgG;  $560.5 \pm 299$  U/ml).

**Table: 2 Comparison Of Characteristics Between Vitamin D Deficient And Vitamin Sufficient**

| PARAMETERS           | SEX    | Vitamin D Deficient | Vitamin D sufficient | p- value |
|----------------------|--------|---------------------|----------------------|----------|
| RBD IgG antibodies   | Male   | 550±241.1           | 2102 ± 393.9         | < 0.0001 |
|                      | Female | 570 ±212.1          | 2665±403.0           | < 0.0001 |
| Spike IgG antibodies | Male   | 32.5 ± 9.828        | 129±12.72            | < 0.0001 |
|                      | Female | 20.45 ±8.27         | 122 ± 22.6           | < 0.0001 |

P<0.001 Highly significant

### DISCUSSION:

In this study All biochemical analyses were performed in batch. This study we also compared both male and female vitamin deficiency to vitamin sufficient recipients. Nutritional deficiency and malnutrition are common in the elderly.

Our study showed that the vaccine recipients were male (71.4%), female (28.4%) Vitamin D Deficient had more than 60 years of age & male (67%) female (33%) were Vitamin D sufficient were detected in this age group. Poor vaccination responses in older people are related not only to frailty (°) which cannot be easily remedied, but also to deficiencies in micronutrients, which can be addressed. An effective immune response requires an adequate host nutritional status a systematic review and meta-analysis of nine studies involving 2367 individuals found lower seroprotection rates to influenza A virus subtype H3N2 and to influenza B virus in those who were vitamin D deficient(°).

Our study showed that the vaccine recipients were Vitamin D Deficient had lower anti spike,RBD antibodies in both male and female when compared to Vitamin D sufficient were detected in this age group.In Oxford vaccine trial recruited older participants with 'few comorbidities, Both the 56–69 and ≥70- year-old groups showed a lower IgG response and lower neutralising antibody titres to a single dose of the Oxford vaccine than the 18–55-year-olds (°). Berry *et al* (°) described an inverse linear relationship between vitamin D levels and respiratory tract infections in a cross-sectional study of 6789 British adults. Meta-analyses have concluded that vitamin D supplementation can reduce the risk of respiratory tract infections(°).Specific to the UK, the 2019 National Diet and Nutrition Survey showed 'a sustained worsening of the dietary intakes and chronic shortages of several of the nutrients involved in supporting the normal immune functions; these included vitamins A, B12, C and D and the trace minerals Zn, Se and Cu(°).

### CONCLUSION:

Vitamin D supplements may increase the levels of T cells in older individuals Thus, the foods or supplementation provide them can play a role in supporting the immune system. Our study suggests improving lifestyle and consuming diets rich in nutrients and vitamins will improve immune responses, which is of utmost importance is providing information on COVID-19 vaccines. We propose that a nutritional supplement should be prescribed to all old age groups for a period of weeks before and after they receive the vaccine along with counselling on good nutrition for improved vaccine response and efficacy.

### Limitations:

At present, major gaps exist in our knowledge of the mechanisms behind the reduced ability of the aging immune system to respond appropriately to both infections and vaccinations.

### Financial Support And Sponsorship

Nil.

### Conflicts Of Interest

There are no conflicts of interest.

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