



ORIGINAL-ARTICLE

Impact of Vitamin D3 on Sleep Disturbance and Covid- 19 Infection

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Abstract

Introduction: Mounting research suggests that vitamin D plays a crucial role in regulating sleep. In particular, insufficient levels of vitamin D have been linked to an increased likelihood of sleep disorders and are correlated with difficulties falling asleep, reduced total sleep time, and waking up during the night in both children and adults.

Aim of study: To evaluate the association if vitamin D with sleep disturbance and previous Covid 19 infection and vaccination

Patients and methods: This retrospective study of include 51 individuals sent for vitamin D3 level and evaluated for sleep disturbance and history of previous Covid 19 infection and Covid vaccination .the individuals with vaccination divided into two groups with single one and with two doses.

Results and discussion: In this study no significant between male and female regarding sleep disturbance and previous covid infection and vaccination in this study no significant difference regarding the age between male and females P value 0.511 and no significant difference in vitamin D3 level between male and female P value 0.363 as seen in table 2 slightly lower in female this go with many studies that show such difference In this study there is no significant difference between sleep disturbance and vitamin D level Increasingly, scientific studies have shown that vitamin D plays a significant part in regulating sleep patterns. Specifically, a lack of vitamin D, known as vitamin D deficiency (VDD), can raise the likelihood of developing sleep disorders and is linked to problems with falling asleep, shorter periods of sleep, and waking up during the night in both children and adults. While the precise mechanisms through which vitamin D influences sleep are not yet fully understood, possible explanations include the presence of vitamin D receptors on key areas of the brainstem that act as pacemaker cells in regulating sleep, as well as the potential role of vitamin D in modulating the hormone melatonin, which is closely associated with sleep In this study, there is no significant difference between the previous history of Covid 19 infection and the status of vitamin D The first study (doi:10.1136/bmj-2022-071230) was conducted in the United Kingdom between May and October 2021.11 Jolliffe and colleagues randomized 3100 participants to a vitamin D test and either 3200 IU/day or 800 IU/day of vitamin D3 for six months if their blood 25-hydroxyvitamin D concentrations were <75 nmol/L. A further 3100 controls received no test and no supplementation. The authors found that neither of the vitamin D doses had any effect on the incidence of covid-19. This trial had several strengths: a high prevalence (64.6%) of participants with inadequate 25-hydroxyvitamin D levels (<50 nmol/L), good adherence to the protocol, and a rigorous endpoint with polymerase chain reaction confirmed covid-19.in this study no significant difference between vitamin D level and state of vaccination against covid 19 New research indicates that having insufficient levels of vitamin D is an independent risk factor for more severe illness, regardless of a person's age or weight. While it is possible that low vitamin D levels may increase the likelihood of contracting COVID-19, this hypothesis has less of a scientific basis. A systematic review and meta-analysis study found that evidence supporting a cause-and-effect relationship between vitamin D status and various COVID-19-related health outcomes is currently uncertain. In this study no correlation between sleep disturbance and previous covid 19 infections The most recent meta-analysis, a review of all the currently available scientific literature, estimates that 52% of people who contract COVID suffer from sleep disturbances during the infection .The most common type of sleep disturbance reported is insomnia

Key words: vitamin D, COVID-19, disturbance, vaccination, previous

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1 | INTRODUCTION

Sun exposure to the skin triggers the synthesis of vitamin D, a crucial nutrient that plays a vital role in maintaining healthy bones and other

physiological processes in the body. The liver and kidneys further convert vitamin D into its active forms, which are used for systemic circulation and

hormonal functions. Interestingly, other tissues, including the immune system, skin, parathyroid gland, intestinal epithelium, prostate, and breast, also produce 1,25(OH)₂D for local use. This is known as paracrine/autocrine function, and it helps regulate a variety of cellular activities in these tissues. The enzyme responsible for producing 1, 25(OH) ₂D in the kidneys, CYP27B1, is regulated by factors such as parathyroid hormone, FGF23, calcium, and phosphate. However, the regulation of the extra-renal enzyme responsible for producing 1, 25(OH) ₂D differs and involves cytokines.

It's essential to maintain adequate levels of vitamin D in the body as research has shown a strong correlation between vitamin D deficiency and negative health outcomes. Therefore, it's crucial to ensure that you're getting enough vitamin D through sun exposure, diet, or supplements to maintain optimal health. [1] Vitamin D is an indispensable nutrient for maintaining human health. It belongs to the steroid hormone family and has a well-established role in regulating calcium metabolism. In addition to this classic function, it also plays a non-classical role in influencing cellular differentiation and proliferation. Several epidemiological studies have demonstrated a strong association between deficiency of 25OHD and common chronic diseases, such as metabolic bone disorders, cardiovascular diseases, tumors, and diabetes. Furthermore, insufficient levels of 25OHD are also a known risk factor for autoimmune diseases and neuropsychiatric disorders. [2] Growing evidence has demonstrated that vitamin D has a role in sleep regulation. Specifically, vitamin D deficiency (VDD) can increase risk of sleep disorders and is associated with sleep difficulties, shorter sleep duration, and nocturnal awakenings in children and adults [3] Research has established a strong correlation between vitamin D deficiency and a compromised immune system, leading to an increased susceptibility to viral infections. Studies have shown that insufficient vitamin D levels are associated with a higher risk of contracting COVID-19. Multiple observational studies have revealed a robust link between low levels of serum vitamin D and COVID-19 infection.

One such study conducted early on in the pandemic examined 489 patients who had previously undergone vitamin D testing. The results showed that those with vitamin D deficiency, characterized by 25-hydroxycholecalciferol levels less than 20 ng/mL or 1, 25-dihydroxycholecalciferol levels less than 18 pg/mL, had a 77% higher risk of testing positive for COVID-19. Therefore, it's essential to maintain optimal vitamin D levels to support immune function and reduce the risk of contracting viral infections, including COVID-19. Regular sunlight exposure, a healthy diet, and supplements can help ensure adequate levels of vitamin D in the body.[4] Several observational studies have shown that there is a negative correlation between serum levels of vitamin D and the incidence or severity of COVID-19. A substantial body of evidence suggests that taking vitamin D supplements could be crucial in slowing the progression of COVID-19 and reducing its severity. Vitamin D is believed to protect against SARS-CoV-2 through a complex mechanism involving the modulation of innate and adaptive immune responses, expression of ACE2, and inhibition of the renin-angiotensin system (RAS). However, it is not yet clear whether vitamin D also plays a crucial role in the efficacy of various COVID-19 vaccines. [5]

2 | AIM OF STUDY

To evaluate the association if vitamin D with sleep disturbance and previous Covid 19 infection and vaccination

3 | PATIENTS AND METHODS

This retrospective study of include 51 individuals sent for vitamin D3 level and evaluated for sleep disturbance and history of previous Covid 19 infection and Covid vaccination .the individuals with vaccination divided into two groups with single one and with two doses.

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Vitamin D assessed by chemiluminescent micro particle immunoassay [CMIA] technology for quantitative determination of 25 -hydroxy vitamin D Reference value 30-40 ng/ml

4 | RESULTS AND DISCUSSION

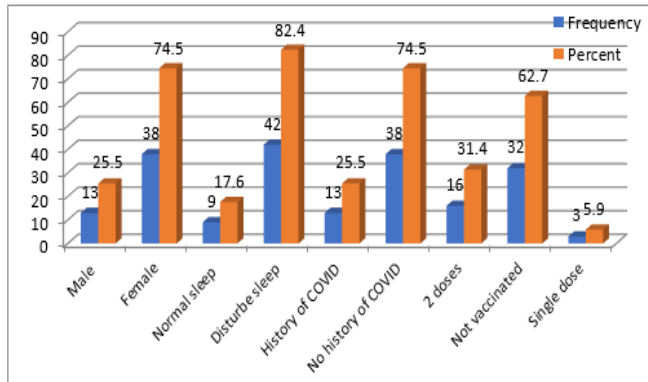


Figure 1: frequency variable groups within the examined samples

In this study of random sample of 51 individuals sex distribution showed 13 male and 38 female [25.5% versus 74.5% respectively] while sleep disturbance seen 42 individuals [82.4%] versus 9 individuals [17.6%], history of previous COVID infection are seen 13 individuals versus 38 not give history of previous covid infection and only 19 are vaccinated against COVID infection with one or two doses versus 32 are non-vaccinated as seen in figure 1

Table 1: sex distribution in different variable groups

		Crosstab		Total	Chi-square value	P
		sex				
Sleep	Normal	2	7	9	0.061	
	Abnormal	15.4%	18.4%	17.6%	0.804	
COVID	Yes	11	31	42		
	No	84.6%	81.6%	82.4%		
Vaccine	2 doses	3	10	13	0.54	
	Not vaccinated	23.1%	26.3%	25.5%	0.817	
	single dose	10	28	38		
		76.9%	73.7%	74.5%		
Total		5	11	16	0.518*	
		38.5%	28.9%	31.4%	0.712	
		7	25	32		
		53.8%	65.8%	62.7%		
		1	2	3		
		7.7%	5.3%	5.9%		
Total		13	38	51		
		100.0%	100.0%	100.0%		

*Fisher Exact test

In this study no significant between male and female regarding sleep disturbance and previous covid infection and vaccination as seen in table 1

Table 2: age distribution in sex group and vitamin D3 level in this

		Group Statistics				Levene's Test	
	sex	N	Mean	Std. Deviation	Std. Error Mean	ANOVA	P
age	Male	13	30.3846	16.00801	4.43982	.437	.511
	Female	38	24.6579	12.27671	1.99155		
Vitamin D	Male	13	12.7000	5.86643	1.62705	.845	.363
	Female	38	10.7763	8.11347	1.31618		

in this study no significant difference regarding the age between male and female P value 0.511 and no significant difference in vitamin D3 level between male and female P value 0.363 as seen in table 2 slightly lower in female this go with many studies that show such difference

A recent study led by Muscogiuri et al. investigated the levels of vitamin D in 500 adult Caucasians residing in Naples, Italy. The study population consisted of an equal number of males and females, with each gender further divided into five different body mass index (BMI) groups, each containing 50 participants. None of the participants were taking vitamin D supplements, and they all had similar sun exposure habits.

The study aimed to compare vitamin D levels between genders and BMI categories. The results revealed that males had significantly higher vitamin D levels than females across all BMI categories. Moreover, the percentage of females with vitamin D deficiency, defined as having less than 20 ng/ml (50 nmol/L) of vitamin D, was higher than that of males. Additionally, the study noted a trend towards lower vitamin D levels in participants with higher BMI.

In conclusion, the study suggests that gender and BMI may impact vitamin D levels, with males and those with lower BMI tending to have higher levels. The findings emphasize the importance of monitoring vitamin D levels, particularly in females and those with higher BMI, who may be at greater risk of vitamin D deficiency. Furthermore, the study underscores the potential benefits of vitamin D supplementation for maintaining optimal levels and reducing the risk of related health complications. [6]

Table 3: Sleep disturbance and vitamin D3

Group Statistics					Levene's Test	
	sleep	N	Mean	Std. Deviation	F	P
Age	Normal	9	26.7778	18.32879	2.913	.094
	Abnormal	42	25.9762	12.37324		
vitD	Normal	9	12.5111	11.71222	2.795	.101
	Abnormal	42	11.0000	6.57070		

In this study there is no significant difference between sleep disturbance and vitamin D level

There is mounting evidence to suggest that vitamin D plays a crucial role in regulating sleep. Studies have shown that a deficiency in vitamin D can increase the risk of sleep disorders, leading to difficulties falling and staying asleep, as well as nocturnal awakenings in both adults and children. While the exact mechanisms through which vitamin D regulates sleep are still not entirely clear, there are several theories that offer plausible explanations. For example, it is thought that vitamin D may interact with pacemaker cells located in the brainstem that play an important role in regulating sleep. Additionally, vitamin D may also be involved in regulating melatonin, which is commonly referred to as the "sleep hormone." [3]

Various studies have suggested that vitamin D deficiency is linked with poor sleep health, including shorter sleep duration, daytime sleepiness, and poor sleep quality. However, it has been challenging to establish a causal relationship between the two, as there is a shortage of randomized controlled trials. Previous trials on vitamin D supplementation have presented conflicting results, with some indicating a positive impact on sleep duration and quality, while others have suggested a decline in sleep quality and a greater need for sleep aids [7]

Table 4: vitamin d and previous covid 19 infections

Group Statistics						
	COVID	N	Mean	Std. Deviation	F	P
Age	Yes	13	27.5385	7.25276	4.356	.042
	No	38	25.6316	14.98002		
Vitamin D	Yes	13	12.3692	7.20756	.026	.872
	No	38	10.8895	7.78056		

In this study there is no significant difference between previous history of Covid 19 infection and status of vitamin D

A randomized controlled trial was conducted in the UK between May and October 2021 to investigate the effects of vitamin D supplementation on the incidence of COVID-19. The study, conducted by Jolliffe et al. and published in BMJ, involved 3100 participants who were randomized to receive either 3200 IU/day or 800 IU/day of vitamin D3 for six months if their blood 25-hydroxyvitamin D concentrations were <75 nmol/L. An additional 3100 controls received no test or supplementation. Despite a high prevalence of inadequate vitamin D levels and good adherence to the protocol, the study found that neither dose of vitamin D had any effect on the incidence of COVID-19, as confirmed by polymerase chain reaction testing.

Another trial conducted in Norway from November 2020 to June 2021 used cod liver oil to investigate the effects of low-dose (400 IU/day) vitamin D supplementation. The trial involved 34,741 participants who were randomized to receive either 5 mL of cod liver oil or 5 mL of placebo oil daily for six months. The study found no effect of cod liver oil on any outcome, including covid-19 confirmed by polymerase chain reaction. The study was conducted by Brunvoll and colleagues and the results were published in a paper with the doi number 10.1136/bmj-2022-071245.[8]

Table5: distribution of vaccination for Covid 19 in examined sample

Report			
Vaccine		age	vitD
2 doses	Mean	28.4375	13.3563
	N	16	16
	Std. Deviation	12.44170	10.51367
Not vaccinated	Mean	24.5938	10.3063
	N	32	32
	Std. Deviation	13.85142	5.98519
Single dose	Mean	30.0000	10.3667
	N	3	3
	Std. Deviation	15.71623	2.65581
Total	Mean	26.1176	11.2667
	N	51	51
	Std. Deviation	13.39350	7.59536
ANOVA		.563	.878
Sig		.573	.422

In this study no significant difference between vitamin D level and state of vaccination against covid 19

Newer studies indicate that low levels of vitamin D may increase the risk of more severe COVID-19 disease, regardless of age or weight. However, it is uncertain whether vitamin D deficiency increases

the risk of contracting COVID-19. A systematic review and meta-analysis study found very uncertain evidence for a causal relationship between vitamin D levels and COVID-19-related health outcomes. Additionally, the use of high doses of vitamin D in COVID-19 patients lacks solid evidence. It is also unclear whether vitamin D deficiency affects immune responses to inactivated SARS-CoV-2 vaccination. Thus, it is believed that low levels of vitamin D in the Middle East region may contribute, at least in part, to the lower effectiveness of inactivated SARS-CoV-2 vaccines in the area. Further investigation is needed to determine whether vitamin D supplementation in the deficient population can improve the efficacy of vaccination. [9]

Table 6: relation of previous covid infection and sleep disturbance

sleep * sex * COVID

Crosstab							Chi-square, P value	
COVID				sex		Total		
Yes	sleep	normal	Count	0	1		1	.325
			% within sex	0.0%	10.0%	7.7%	.569	
		abnormal	Count	3	9	12		
			% within sex	100.0%	90.0%	92.3%		
	Total	Count	3	10	13			
		% within sex	100.0%	100.0%	100.0%			
	No	sleep	normal	Count	2	6	8	.009
				% within sex	20.0%	21.4%	21.1%	.924
			abnormal	Count	8	22	30	
				% within sex	80.0%	78.6%	78.9%	
Total		Count	10	28	38			
		% within sex	100.0%	100.0%	100.0%			
Total	sleep	normal	Count	2	7	9	.061	
			% within sex	15.4%	18.4%	17.6%	0.804	
		abnormal	Count	11	31	42		
			% within sex	84.6%	81.6%	82.4%		
	Total	Count	13	38	51			
		% within sex	100.0%	100.0%	100.0%			

In this study no correlation between sleep disturbance and previous covid 19 infections

According to the latest meta-analysis, which reviewed all the current scientific literature, approximately half (52%) of individuals who are infected with COVID-19 experience sleep disturbances. Insomnia was found to be the most frequently reported type of sleep disturbance in COVID patients. [10]

5 | CONCLUSION

There is no significant correlation between the status of vitamin D and sleep disturbance and we

need a large sample to find if there is a significant correlation

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