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Vitamin D Serum Levels and Its Association With COVID 19 Infection In Babylon Governorate, Iraq.

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Background:

Considering the role of the data that indicate the importance of Vitamin D adequacy in protecting human being againstdifferent pathogens in patients exposed to infectious agents, the role of this Vitamin in Covid-19 patients is a matter of debate.

Objectives: to identify the association between vitamin D level and infection with SARS-COV-2 of adult patients attending or admitted to Merjan Teaching Hospital , Babylon , Iraq

.**Methodology:** this was a cross sectional comparison study of 240 participants, the total sample mean ±SD age was 46.9±15.4 years, 120confirmed diagnosed cases and admitted to coronavirus unit and 120 negative cases (comparison group). The study carried out from January to June 2021 in Merjan Teaching Hospital, Babylon, Iraq. A pretested questionnaire used to interview patients after obtaining their verbal consents. Serum 25(OH) vitamin D measured to both groups of participants using immunoassay method (maglumi instrument) and body mass index (BMI) measured. The questionnaire included demographicinformation, clinical symptoms, unhealthy habits, and underlying health conditions, (comorbidities related to each participant elicited and recorded).

Results: This study showed that vitamin D deficiency or insufficiency were positively and significantly associated with SARS-COV-2 infection, COVID-19-cnfirmed patients had significantly lower serum vitamin D levels than comparison group ($p = 0.01$). In addition, the results revealed that the COVID-19 cases with Vitamin D inadequacy were significantly associated with low educational level, low socioeconomic status, and much lowest among female patients ($p<0.05$).

Conclusions: Vitamin D inadequacy was significantly associated with COVID 19 infection.

Keywords: Vitamin D, COVID 19 Infection, Babylon Governorate, Iraq

Introduction

Vitamin D is a fundamentally important nutrient that the human body requires for proper function. A low vitamin D level in the body may be harmful including a reduction in immune system capability [1] (Mendes, M.M., et al., 2020). Vitamin D is a steroid hormone that has a role in producing antimicrobial peptides as

well as in the expression of genes involved in the intracellular destruction of pathogens [2]. It reported that immune system is negatively affected by vitamin D in adequacy, which would increase the susceptibility of sufferers to different viral infections[3]. There are several lines of evidence that might support a role for vitamin D status in SARS-CoV-2 infection[4].Studies have investigated the possible relation between serum 25-hydroxyvitamin D [25(OH)D] and COVID-19 severity [5].The epidemiology data, remains unclear on the impact of vitamin D status on Covid-19 infection [6], as well as from other reports in patients with or without COVID-19 and their [7]. Iraq like other countries is in the grip of the SARS-COV-2 pandemic. Measures that can overcome the risk of this deadly infection are strongly an urgently needed. This study explores the associations between vitamin D serum level and diagnosed SARS-COV-2 with PCR and CTS negatives comparison group.

Method:

This was a cross sectional comparison study conducted on a purposive non-probability sample which includes 240 adult patients (> 18 years of age), hundred twenty COVID-19 confirmed patientswho were admitted to coronavirus unit and 120 PCR and Computerized Tomography Scan negatives patients who seek care for different disease (comparison group). The study carried out from January to June 2021 in Merjan Teaching Hospital, Babylon, Iraq. Data are collected from the patient who agreed to participate in this study and or patient's companions by interview using pretested data collection tool (questionnaire) adopted from previous similar study [8](Abdollahi, A., et al., 2021). Data also gathered from patient's hospital records.The questionnaire includes demographicinformation , clinical symptoms, unhealthy habits, and underlying health conditions (comorbidities related to each participant were elicited and recorded)such as the presence of common comorbidities (i.e. hypertension, type 2 diabetes, obesity,the questionnaire includes questions about tobacco smoking habit Smoking status was coded as current or nonsmoker, questions regarding knowledge about the importance of vitamin D are included such as:1. Do you think that vitamin D is important to your health?2. Do you think that VD is helpful in preventing COVID 19 infection? 3.What are the ssources ofyour knowledge about health effects of VD adequacy?

Inclusion criteria: 1. Patients from all age groups and both gender whom except to participate in this study.2. Admitted to the wards of infectious diseases or isolation and the ICU during the period of the studyPatient residency in Babylon governorate.

Exclusion criteria:1. Population less than 18 years old, pregnant women, chronic renal disease on dialysis, 2. patient with chronic liver disease, 3. patient with inflammatory bowel disease, 4. patient with malabsorption syndrome, 5. patient with osteomalasia, 6. patients on seizure-control drug, (as phenytoin and phenobarbital), 7. Patients on anti-tuberculosis (rifampicin), 8. Patient on weight loss drug, 9. Patient who lives in other governorates, 10. Patients who readmitted for further treatment or checkups, 11. Patient, who refused to participate in the study, severely disabled patient, patients who suffer from mental

illness.Serum 25(OH) vitamin D measured to both groups of participants using immunoassay method (maglumi instrument) and body mass index (BMI) measured**.Statistical analysis:** Continuous variables are used as mean ± standard deviation (SD) andcompared as appropriate with the Student's t-test. Categorical variables of the current study are presented as numbers and percentages and compared using the chi-squared test or the Fisher exact test as requested. P value < 0.05 considered as statistically significant.

Results

A sample of 240 persons, 120 of them were patients diagnosed as COVID-19 (diagnosed by PCR and CT scan) and 120 Comparison group (PCR and CT scan negatives). The total sample mean ±SD for age are 46.9±15.4 yrs. (ranged 20-90 yrs.); the mean ±SD of age are 52.8±15.9 yrs. and 41±12.3 years for patients and comparison group respectively. More than half of patients and comparison groups are females as shown in Table -1-, this table also reveals that the most affected age groups of participants are 40-49 years and 50-60 years respectively. About half of them have low educational level, 57% of participants mention that they have enough monthly income.Table-2- shows the Means and standard deviations of baseline characteristics of the study group (age mean 46.9±15.4 years), while the mean of serum VD for the total sample was 20.52± 0.92 ng/ml.Table -3- depicts that the regular sun exposure is significantly higher among the comparison group (chi-square =14.041, df = 1, p value = 0.002). Regarding smoking habits, current smokers are significantly higher among comparison group while ex smoking is positively and significantly higher among COVID 19 cases. P = .007. Table -4- shows the relationship between the prevalence of hypertension and diabetes in the patients and comparison groups, both diseases are significantly and highly prevalent among patients as compared to the control group p= 0.019. Table (5, 6) and figure -1- demonstrate the Vitamin D level differences between females and males in both groups, females have significantly and statistically lower serum VD level than males; t student test value = 4.26, df = 238, p <0.01. The Vitamin D level differences between COVID-19 patients and other comparison group, COVID-19 patients have a significantly lower serum VD as compare to the comparison group; (t-test value =4.44, df = 238, p <0.01). Figure -2- shows the VD status according to sun light exposure; those who not regularly exposed to sunlight were suffering more from VD deficiency.

Table 1: Demographic and socio-economic features of participants (N=240)

		Sample		
		COVID-19 **No. (%)**	Comparison group **No. (%)**	**Total No. (%)**
Age groups	20-29	10 (8)	29 (24)	39 (16)

		Sample		
		COVID-19 **No. (%)**	Comparison group **No. (%)**	**Total No. (%)**
(Years)	30-39	13 (11)	28 (23)	41 (17)
	40-49	25 (21)	31 (26)	56 (23)
	50-59	29 (24)	20 (17)	49 (20)
	60-69	17 (14)	12 (10)	29 (12)
	70-79	21 (18)	-	21 (9)
	80-89	5 (4)	-	5 (2)
Gender	Males	58 (48)	50 (42)	108 (45)
	Females	62 (52)	70 (58)	132 (55)
Educational level	Illiterate	27 (23)	17 (14)	44 (18)
	Primary	40 (33)	34 (28)	74 (31)
	Secondary	30 (25)	32 (27)	62 (26)
	University	23 (19)	37 (31)	60 (25)
Income	not enough	68 (57)	28 (23)	96 (40)
	Enough	51 (42.2)	86 (72)	137 (57)
	morethan enough	1 (0.8)	6 (5)	7 (3)

Table 2: Means and standard deviations of baseline characteristics of the study group

Variable	**Mean (±SD)**
Age (years)	46.89 (15.395)
BMI	31.3 (6.42)
Vitamin D levels (ng/mL)	20.52 (10.92)
Cigarettes smoked per day (smokers)	26.84 (10.2)

Table 3: Sun exposure and tobacco smoking habits among participants in the study groups (N=240).

Behavior	**Sample**			**Chi-Square test**	
	COVID-19 No. (%)	**Controls** No. (%)	Total No. (%)	Test value	Sig.

Sun exposure (3 times/ week)	No	95 (79)	92 (77)	187 (78)	14.041	**0.002**
	Yes	43 (36)	72 (60)	115 (48)		
Tobacco smoking	No	77 (64)	48 (40)	125 (52)		
	Non smoker	88 (73)	78 (65)	166 (69)		
	Smoker	14 (12)	32 (27)	46 (19)	9.932	**0.007**
	Ex-smoker	18 (15)	10 (8)	28 (12)		

Table 4: Comorbidities among the studied participants (n = 240)

Variable		**COVID-19 patients**	**Comparison group**	**Total**		
Comorbidity	Without DM	46 (38)	71 (59)	117 (49)	Chi square = 11.757 df = 4	p-value = 0.019
	Diabetes M.	9 (8)	5 (4)	14 (5.8)		
	Hypertension	26 (22)	22 (18)	48 (20)		
	DM and HT	28 (23)	17 (14)	45 (18.7)		
	Other cardiovascular	11 (9)	5 (4)	16 (6.5)		

Table 5: Vitamin D serumlevel between males and Females and between COVID-19 patients and other comparison group

Gender	**Number**	**Mean of vitamin D levels (ng/mL)**	**±SD**	**t**	**df**	**p-value**
Male	108 (45%)	23.74	9.3	4.26	238	**p <0.01** [a]
Female	132 (55%)	17.9	11.47			
	Number	**Mean of vitamin D levels (ng/mL)**	**±SD**	**t**	**df**	**p-value**
Comparison group	120	23.54	12	4.44	238	**p <0.01** [a]
Confirmed Cov-Sars 2 cases	120	17.5	8.7			

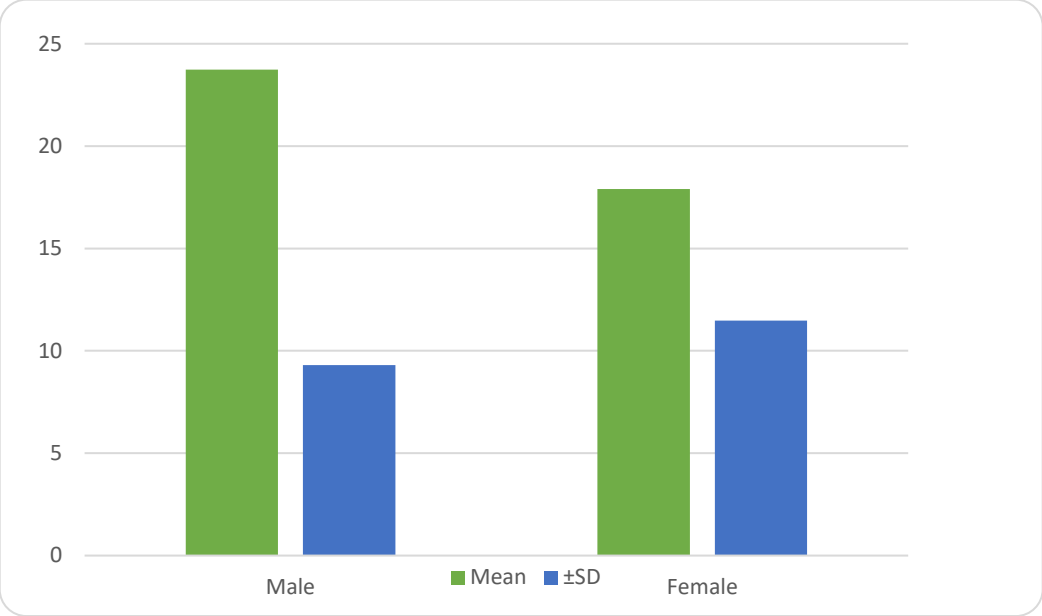

Figure 1: mean difference of VD serum levels between males and females among participants included in this study (n=240).

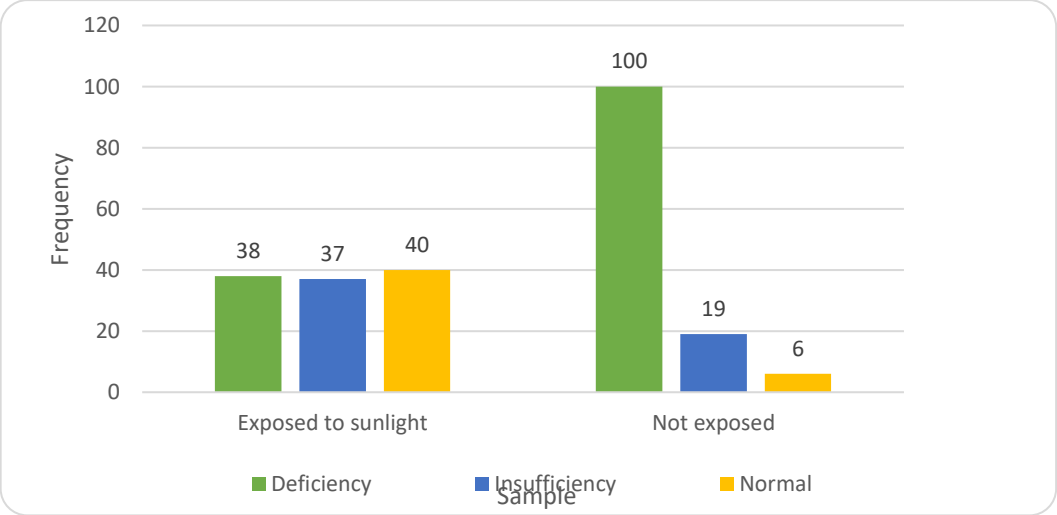

Figure 2: Distribution of participants according to sunlight exposure and serum vitamin D levels

Discussion

To the best of our knowledge, this study is the first one in our country that address the relationship between Vitamin inadequacy and susceptibility to SARS-COV-2 disease, this study explains a positive and significant association between low serum VD levels among females compared to females, this finding is

similar to the results of other studies [9,10].This finding disagrees with finding reported by a study conducted by[11] who found no significant difference of VD serum level between males and females, in our current study the gender difference possibly due to wearing cultural long clothes(hijab) and religious factors social habits and the effects of multiple pregnancy. Findings of the current study reveals a highly statistical significant lower VD serum level among diagnosed COVID-19 patients as compared to patients attending Merjan Teaching Hospital in Babylon Governorate, Iraq who tested negative for PCR and CTS .Thus suggesting a relationship between VD inadequacy and COVID-19 infection, this results goes in line with other studies that explored the inverse correlation between mean vitamin D levels and the presence of significantly lower vitamin D levels in SARS-CoV-2 patients compared with negative patients supporting the association between insufficient vitamin D levels and SARS-Cov-2 positivity [12]. There are plausible biological mechanisms supporting the role of vitamin D in COVID-19 severity[13]. A descriptive study carried out on adults admitted to Inha University Hospital, South Korea that aimed to assess the nutritional status of patients with COVID-19 found extreme vitamin D deficiency in 24% of patients in the COVID-19 group and 7.3% in the control group. The COVID-19 group showed significantly lower vitamin D values than the stable control group[14]. The mean vitamin D level is significantly and negatively associated with both infection and mortality rate of COVID-19 among Asian countries upon predicting with all confounders[15].Most of the articles demonstrated that vitamin D status in the blood could determine the chances of catching coronavirus, coronavirus severity, and mortality. Therefore, keeping appropriate blood levels of vitamin D through supplementation or through sunshine exposure recommended for the public to be able to cope with the pandemic [16]. (Yisak H, et al., 2021).Different other observational studies agree with our findings [17]. The findings of the current study current study show a significant correlation between COVID -19 infection and high arterial blood pressure and diabetes mellitus. A study has reported contradictory results regarding the association between vitamin D level and hypertension in men and women [18]. A study recommends that Vitamin D can used as an adjuvant drug to control the blood pressure on hypertensive patients with vitamin D deficiency[19].This study showed a significant relationship between diabetes mellitus and level vitamin D status. The finding of [32] supported these results.In this study, current tobacco smoking is not significantly associated with COVID -19 infection and vitamin D inadequacy, this result disagrees with the finding of other researchers [14] who found that a significant relationship between smoking and vitamin D low serum level. An association between smoking and low VD being found in other studies showing current smoking is associated with lower VD serum concentrations that contradict our finding [15].The current study depicts that low exposure to sun light is significantly associated with VD inadequacy this finding supported by the finding of a local study carried out by Jawad I and Baiee H.It is believed that sunlight exposure of arms and legs for 5-15 minutes at midday during the summer months could produce about 3,000 IU of vitamin D[20, 21]

Conclusion

COVID-19 patients have low serum level of VD, indicating that they represent a population with a higher risk for vitamin D deficiency, awareness strategy should be established among health care providers and public to prevent and control COVID-19 pandemic.

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Conflict of interests

The researchers declare that no conflict of interests.

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References

1. Mendes J, Santos A, Borges N, Afonso C, Moreira P, Padrão P, Negrão R, Amaral TF. Vitamin D status and functional parameters: A cross-sectional study in an older population. PLoS One. 2018 Aug 21;13(8):e0201840.

2.Alvarez-Rodriguez L, Lopez-Hoyos M, Garcia-Unzueta M, Amado JA, Cacho PM, Martinez-Taboada VM. Age and low levels of circulating vitamin D are associated with impaired innate immune function. J Leukoc Biol. 2012;91(5): 829-838.

3.Martineau AR, Jolliffe DA, Hooper RL, Greenberg L, Aloia JF, Bergman P, et al. Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data. Br Med J. 2017;356:i6583.

4. Hernández JL et al., 2021], Hernández JL Nan D, Fernandez-Ayala M, García-Unzueta M, Hernández-Hernández MA, López-Hoyos M, Muñoz-Cacho P, Olmos JM, Gutiérrez-Cuadra M, Ruiz-Cubillán JJ, Crespo J, Martínez-Taboada VM. Vitamin D Status in Hospitalized Patients with SARS-CoV-2 Infection. J ClinEndocrinolMetab. 2021 Mar 8;106(3):e1343-e1353.

5. Ye K, Tang F, Liao X, Shaw BA, Deng M, Huang G, Qin Z, Peng X, Xiao H, Chen C, Liu X, Ning L, Wang B, Tang N, Li M, Xu F, Lin S, Yang J. Does Serum Vitamin D Level Affect COVID-19 Infection and Its Severity?-A Case-Control Study. J Am CollNutr. 2020 Oct 13:1-8.

6.Reis BZ, Fernandes AL, Sales LP, Santos MD, Dos Santos CC, Pinto AJ, Goessler KF, Franco AS, Duran CSC, Silva CBR, Macêdo MB, Dalmolin HHH, Baggio J, Balbi GGM, Antonangelo L, Caparbo VF,

Gualano B, Murai IH, Pereira RMR. Influence of vitamin D status on hospital length of stay and prognosis in hospitalized patients with moderate to severe COVID-19: a multicenter prospective cohort study. Am J ClinNutr. 2021 Aug 2;114(2):598-604.

7.Maghbooli Z, Sahraian MA, Ebrahimi M, Pazoki M, Kafan S, Tabriz HM, et al. Vitamin D sufficiency, a serum 25-hydroxyvitamin D at least 30 ng/mL reduced risk for adverse clinical outcomes in patients with COVID-19 infection. PLoS One. 2020 Sep 25;15(9):e0239799.

8.AbdollahiA,Sarvestani HK, Ghaderkhani S, Mahmoudi-AliabadiM,Jafarzadeh B, Mehrtash V. The association between the level of serum 25(OH) vitamin D, obesity, and underlying diseases with the risk of developing COVID-19 infection: A case–control study of hospitalized patients in Tehran, Iran. J Med Virol. 2021;93:2359–2364.

9.Santos A, Amaral TF, Guerra RS, et al. Vitamin D status and associated factors among Portuguese older adults: results from the Nutrition UP 65 cross-sectional study.BMJ Open. 2017;7:e016123.

10.Das P,Samad N, AhinkorahBO,Hagan JE, Peprah P, Mohammed A, Seidu AA. Effect of Vitamin D Deficiency on COVID-19 Status: A Systematic Review. COVID 2021, 1, 97–104.:

11.El sammakMY, Al Wossaibi AA, Al HoweishA,Alsaeed J. High prevalence of vitamin D deficiency in the sunny Eastern region of Saudi Arabia: a hospital-based study. EMHJ - Eastern Mediterranean Health Journal, 2011;17 (4), 317-322.

12. Ilie PC, Stefanescu S, Smith L. The role of vitamin D in the prevention of coronavirus disease 2019 infection and mortality. Aging ClinExp Res. 2020;32(7):1195–8.

13. Ben-Eltriki M, Hopefl R, Wright JM, Deb S. Association between Vitamin D Status and Risk of Developing Severe COVID-19 Infection: A Meta-Analysis of Observational Studies. J Am CollNutr. 2021 Aug 31:1-11.

14.Al-Dabhani K, Tsilidis K, Murphy N. et al. Prevalence of vitamin D deficiency and association with metabolic syndrome in a Qatari population. Nutr& Diabetes. 2017; 7 (e263)

15.Moon JH, Kong MH, Kim HJ. Effect of Secondhand Smoking, Determined by Urinary Cotinine Level on Bone Health. International journal of preventive medicine. 2018; 9 (1)|: 14

16. Yisak235-Yisak H, Ewunetei A, Kefale B, Mamuye M, Teshome F, Ambaw B, YidegYitbarek G. Effects of Vitamin D on COVID-19 Infection and Prognosis: A Systematic Review. Risk ManagHealthc Policy. 2021;14:31-38

17. Panagiotou G, Tee SA, Ihsan Y, et al. Low serum 25-hydroxyvitamin D (25[OH]D) levels in patients hospitalized with COVID-19 are associated with greater disease severity. ClinEndocrinol (Oxf). 2020;93(4):508-511.

18. Snijder, M.B., Lips, P.T.A.M., Seidell, J.C., Visser, M., Deeg, D.J.H., Dekker, J.M. and Van Dam, R.M.,. Vitamin D status and parathyroid hormone levels in relation to blood pressure: a population-based study in older men and women. Journal of internal medicine, 2007; 261(6):.558-565.

19.He S, Hao X. The effect of vitamin D3 on blood pressure in people with vitamin D deficiency: A system review and meta-analysis. Medicine (Baltimore).2019;98(19):e15284.

20.Jawad IH, Baiee HA. Prevalence of Vitamin D deficiency and its correlates with overweight and obesity in community-dwelling old adults. Med J Babylon 2020;17:36-40.

21.Nakashima A, Yokoyama K, Yokoo T, Urashima M. Role of Vitamin D in diabetes mellitus and chronic kidney disease. World J Diabetes. 2016;7:89–100.National Institutes of Health Office of Dietary Supplements. Vitamin D Accessed, 2015.