Vitamin D serum level and its correlation in obsessive–compulsive disorder

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Background and aim
Vitamin D has a long-known critical function in calcium metabolism and its role in proliferation, differentiation, and immunomodulation. A lot of studies report that low vitamin D serum level might be a risk factor contributing for the development of obsessive–compulsive disorder (OCD). The aim of this study was to evaluate the impact of sociodemographic factors on vitamin D and assess how prevalent is the hypovitaminosis D and its relation with OCD.
Patients and methods
In this study, data were collected from 50 participants of OCD males aged from 18 to 40 years. Vitamin D serum levels of participants in this study were measured using enzyme-linked immunosorbent assay kit.
Results
There is no significant relation regarding vitamin D level and OCD symptom severity found in our study. There is no statistically significant difference between participants of case group with low vitamin D levels (deficient and insufficient) in relation to OCD symptoms and severity.
Conclusion
There is a relation between low vitamin D serum level and OCD. However, there is no relation between vitamin D serum level, symptoms, or severity of OCD.

Keywords:
hypovitaminosis D, obsessive–compulsive disorder, vitamin D serum level

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Introduction

Vitamin D is considered a compound that has been shown to play a vital role in various biological processes as neurodevelopment and function (Girgis *et al.*, 2013). Nowadays, it is increasingly recognized as a necessary neurosteroid with various actions in the brain (Cui *et al.*, 2015). Several studies tried to find the association between vitamin D and brain health, as well as the impact of vitamin D deficiency on the brain (Miller *et al.*, 2016). Deficiency of vitamin D in maternal and offspring shows some disabilities in early life, including learning and memory problems, as well as evidences of increased lateral ventricle volume and altered neural expression of genes involved in dopamine and glucocorticoid-related pathways, suggesting autism and schizophrenic-like disorders (Yates *et al.*, 2018).

Obsessive–compulsive disorder (OCD) is a common, chronic and debilitating disorder in which the patient suffered from uncontrollable, reoccurring intrusive thoughts (obsessions) and behaviors (compulsions) that he or she feels and suffers the urge to repeat over and over (Goodman *et al.*, 2014). The worldwide prevalence of OCD is 2–3% and the WHO lists the disorder as one of the most devastating disorders (Murray and Lopez, 1997; Angst *et al.*, 2004; Kessler *et al.*, 2005; Murphy *et al.*, 2014). Epidemiologically, the mean age of presentation of OCD is around 25 years (Tripathi *et al.*, 2018).

Many reports demonstrate a crucial role for vitamin D in brain development and functions and etiopathogenesis of neuropsychiatric disorders (Harms *et al.*, 2011; Eyles *et al.*, 2013). Vitamin D deficiency can also participate in the development of depression and anxiety disorders (Anglin *et al.*, 2013). Vitamin D has been searched for its effect in anxiety disorders, including OCD, and it was found to be significantly lower in patients with anxiety disorders compared with controls (Bicikova *et al.*, 2015).

Patients and methods

The study was designed as a cross-sectional study held at the outpatient clinic Institute of Psychiatry, Ain Shams

University Hospital, following approved standards to the ethical committee of Ain Shams University. A written informed consent was obtained from study participants after explanation of the purpose of the study. Anonymity of the subjects ensured, no identifying information obtained and the results stored in a secure place with access only to the principal investigator of the study. The study conforms to the standards of the Ethical Review Committee, Ain Shams University. The target population was males with age range 18–40 years. It was conducted from July 2018 and ended on January 2019.

The sample size was 25 patients per group (50 total samples) matched in age, it was calculated using power and sample size program version 3 using mean difference of vitamin D=14.5 (Bicikova *et al.*, 2015).

The study excludes females, other psychiatric disorders as psychosis, mood disorders, and substance-use disorder.

Measures for assessing obsessive–compulsive disorder

Structured clinical interview for Diagnostic and Statistical Manual of Mental Disorders, 4th ed. axis 1

Interviewers usually read mandatory probes that include suggested follow-up items designed to evaluate a specific diagnostic criterion in order to perform the scale. The SCID uses a decision-tree approach that prompts the interviewer to skip subsequent questions, or whole diagnostic sections, when sufficient criteria are not met to warrant further questioning. Scoring the SCID occurs in stages as the interview proceeds. It can typically be done in a few minutes by the interviewer after administration of each module (First *et al.*, 1997).

We use the most recent versions of this measure-parallel Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (DSM-IV), axis I and II diagnoses (First *et al.*, 2002) and Diagnostic and Statistical Manual of Mental Disorders, 5th ed. diagnoses (First *et al.*, 2015).

Yale–Brown obsessive–compulsive scale

The Yale–Brown obsessive–compulsive scale (Y-BOCS) is a clinician-rated scale that detects the presence and severity of obsessions and compulsions indexed to the past week. Total Y-BOCS scores range from 0 to 40, with higher scores indicating greater severity of OCD symptoms. Scores on the obsession and compulsion subscales range from 0 to 20, but only the total Y-BOCS score is interpreted. Total scores can be split into five categories, based on the severity of symptoms, people who have a total Y-BOCS score. Under 7 are likely to be subclinical, 8–15 are likely to have a mild case of OCD, 16–23 are likely to have a moderate case of OCD, 24–31 are likely to have a severe case of OCD, and 32–40 are likely to have an extreme case of OCD. Also, it assesses the different types of obsessions (contamination, aggressive, religious, doubt, and somatic) and compulsions (cleaning/washing, checking, and repeating) (Pina *et al.*, 2015).

Enzyme-linked immunosorbent assay

This test kit is a competitive protein-binding assay for the measurement of 25 hydroxyvitamin D. It is based on the competition of 25 hydroxyvitamin D present in the sample with 25 hydroxyvitamin D tracer, for the binding pocket of vitamin D-binding protein (Gc globulin). Since all circulating 25 hydroxyvitamin D is bound to vitamin D-binding protein, samples must be precipitated with precipitation reagent to extract the analyte. The supernatant can be used without further treatment within the test. All steps follow the manufacturer's protocol.

Statistical analysis

The collected data were revised, coded, tabulated, and introduced to a PC using Statistical Package for Social Science (SPSS 20). Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Data were presented as mean and SD; χ^2 test, P value, and suitable correlation analysis was done according to the type of data obtained for each parameter.

Results

Table 1 shows that age, level of education, or marital status did not affect vitamin D level due to a nonsignificant relation. However, there was statistical significance between vitamin D and smoking, indicating the impact of this parameter.

Table 2 shows that there is a statistically significant difference between the control group and cases regarding vitamin D level as mean vitamin D level in the control group was 21.14±8.78 ranging from 5 to 40 with 10 (40.0%) participants with deficient vitamin D level, 13 (52.0%) participants with insufficient vitamin D level, and two (8.0%) participants with sufficient vitamin D level, while mean vitamin D level in the case group was 16.08±6.61 ranging from 6.5 to 30 with 18 (72.0%) participants with deficient vitamin D level, seven (28.0%) participants with insufficient vitamin D level, with no participants having sufficient levels.

Table 1 Relation between control group and case group regarding sociodemographic data

	Control group [*n* (%)] *N*=25	Case group [*n* (%)] *N*=25	Test value	*P* value	Significance
Age					
Mean±SD	27.04±3.91	28.68±7.11	–1.010[a]	0.317	NS
Range	19–38	18–40			
Level of education					
High	19 (76.0)	17 (68.0)	2.111	0.348	NS
Middle	6 (24.0)	6 (24.0)			
Below middle	0	2 (8.0)			
Smoking					
Nonsmoker	17 (68.0)	10 (40.0)	3.945	0.047	S
Smoker	8 (32.0)	15 (60.0)			
Marital status					
Married	10 (40.0)	13 (52.0)	2.007	0.367	NS
Single	15 (60.0)	11 (44.0)			
Divorced	0	1 (4.0)			

[a]Independent *t* test. *P* value more than 0.05: nonsignificant (NS); *P* value less than 0.05: significant (S); *P* value less than 0.01: highly significant (HS).

Table 2 Relation between both case and control groups regarding vitamin D serum level

	Control group *N*=25	Case group *N*=25	Test value	*P* value	Significance
Vitamin D					
Mean±SD	21.14±8.78	16.08±6.61	2.302[a]	0.026	S
Range	5–40	6.5–30			
Vitamin D deficiency					
Deficient	10 (40.0)	18 (72.0)	6.086[b]	0.048	S
Insufficient	13 (52.0)	7 (28.0)			
Sufficient	2 (8.0)	0			

P value more than 0.05: nonsignificant (NS); *P* value less than 0.05: significant (S); *P* value less than 0.01: highly significant (HS).
[a]Independent *t* test. [b]χ^2 test.

Table 3 Obsessive–compulsive disorder symptoms and severity in participants of case group using Yale–Brown obsessive–compulsive scale

	Case group *N*=25
Obsessions	
Median (interquartile range)	1 (1–2)
Range	0–5
Compulsions	
Median (interquartile range)	1 (0–2)
Range	0–4
Severity [*n* (%)]	
Very mild	0
Mild	4 (16.0)
Moderate	10 (40.0)
Severe	9 (36.0)
Extremely severe	2 (8.0)

Table 3 shows that participants of the case group are having a range of obsessions 1–2 while having 0–2 compulsions, and for severity 2, 8% participants have extremely severe symptoms, nine (36%) have severe symptoms, 10 (40%) have moderate severity, and four (16%) have mild symptoms with no participants with very mild severity.

Table 4 indicates that there is no statistically significant result regarding vitamin D level and its relation to the severity of OCD symptoms.

Table 5 shows that there is no statistically significant result regarding vitamin D level and its relation to OCD symptoms.

Table 6 shows that there is no statistically significant difference between participants of the case group with low vitamin D levels (deficient and insufficient) in relation to OCD symptoms and severity.

Discussion

Much research has been undertaken in the past two decades to help in finding the underlying biological mechanisms behind OCD, but it is still an area plagued by controversial results (Milaneschi *et al.*, 2014).

In the present study, habits of medical importance, especially smoking, were 17 participants of controls were nonsmokers, while eight were smokers with no other special habits of medical importance, while four

Table 4 Relation between vitamin D serum level and obsessive–compulsive disorder severity

Severity	Vitamin D		Test value[a]	*P* value	Significance
	Mean±SD	Range			
Mild	12.35±2.66	10.40–16.10			
Moderate	18.08±5.27	10.90–27.00	0.926	0.446	NS
Severe	16.31±8.89	6.50–30.00			
Extremely severe	12.45±4.74	9.10–15.80			

Table 5 Correlation between vitamin D serum level and obsessive–compulsive disorder symptoms

	Vitamin D	
	r	*P* value
Obsessions	–0.377	0.063
Compulsions	–0.146	0.485

Table 6 Relation between low vitamin D serum levels (deficient and insufficient) in case group regarding obsessive–compulsive disorder symptoms and severity

	Vitamin D deficiency [*n* (%)]				
	Deficient *N*=18	Insufficient *N*=7	Test value	*P* value	Significance
Obsessions					
Median (interquartile range)	1.00 (1–2)	1.00 (1–1)	–0.891‡	0.373	NS
Range	0.00–5.00	1.00–4.00			
Compulsions					
Median (interquartile range)	1.0 (0–2)	1.0 (0–1)	–0.192‡	0.848	NS
Range	0.0–3.0	0.0–4.0			
Severity					
Very mild	0	0			
Mild	4 (22.2)	0			
Moderate	7 (38.9)	3 (42.9)	3.560[a]	0.313	NS
Severe	5 (27.8)	4 (57.1)			
Extremely severe	2 (11.1)	0			

P value more than 0.05: nonsignificant (NS); *P* value less than 0.05: significant (S); *P* value less than 0.01: highly significant (HS). [a]χ^2 test. ‡Mann–Whitney test.

cases of 10 participants were nonsmokers with 15 participants who are smokers in accordance with (Bejerot and Humble, 1999) who found that 14% of the OCD patients were current smokers in 193 OCD participants, leading to a hypothesis that nicotine might exacerbate an already-hyperactivated frontal cortex and worsen OCD symptoms.Regarding the impact of education, in controls, 19 participants were highly educated, while six participants were middle level of education, while in the case group, 17 participants were highly educated, six participants were of middle education, and two participants below middle education in the same line with (Jaisoorya *et al.*, 2015) who reported that adolescents with OCD have greater psychological distress and poorer academic performance that was assumed to comorbid attention deficit and hyperactivity.

Our study did not show a statistically significant relation between the level of education or marital status to vitamin D level. However, Naugler *et al.* (2013) showed that mean levels of 25 hydroxyvitamin D varied widely by areas of participant's residence and that the predominant predictors of this variation seemed to be age that was inconsistent with our results, which may be due to variability in dietary habits and exposure to the sun and the education level among the variables considered in that study.

Our study does not show statistically significant results regarding vitamin D level and its relation to OCD symptoms; also, our study does not show a statistically significant difference between participants of the case group with low vitamin D levels (deficient and insufficient) in relation to OCD symptoms and severity, which is consistent with Bicikova *et al.* (2015), Esnafoğlu and Yaman (2017) who reported that the levels of vitamin D serum level were significantly lower in both of the groups of depressive patients and the group of patients with anxiety disorders

– including OCD in comparison with the group of control persons confirming that lower vitamin D levels in OCD patients have a negative correlation to the severity of the disease.

Conclusion

In the present study, we can conclude that there is a relation between low vitamin D serum level and OCD. Furthermore, based on the present results, there is no relation between vitamin D serum level, symptoms, or severity of OCD.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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