Vitamin D plasma levels during summer in a psychiatric population are comparable to the winter levels of healthy individuals

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ABSTRACT
INTRODUCTION: Our understanding of the influence of a low plasma-25(OH) vitamin D₃ (25-OHD) level on psychiatric disease is growing. Very limited information is available about the 25-OHD level in psychiatric populations. This study was initiated to determine which patients should have their 25-OHD levels analysed and who would require treatment.

MATERIAL AND METHODS: This retrospective, cross-sectional study comprised patients admitted for hospitalisation at Mental Health Centre Frederiksberg from 25 May to 9 September 2010. A total of 170 patients and their corresponding 25-OHD results were included.

RESULTS: Of the 170 patients, 55% (n = 93) were women and 45% (n = 77) were men. Thirteen patients (8%) had severe to moderate 25-OHD deficiency, 59 had insufficiency and 98 had a normal 25-OHD. In total, 42% of the results were abnormal. No differences were detected according to sex, age or diagnosis group. No correlation was found between 25-OHD and cobalamine, thyroid-stimulating hormone or Ca²⁺.

CONCLUSION: It should be possible from the patient history, i.e. geographical or lifestyle issues, to identify patients at risk of 25-OHD deficiency or insufficiency, and only perform the 25-OHD test on these patients. A vitamin D supplement may be considered for all high-risk patients even without knowing their exact 25-OHD values. This would allow such patients to be treated as recommended (the Danish Health and Medicines Authority). The recommended treatment for “patients who do not get out and who avoid the sun” is a daily 10 µg vitamin D supplement. Some of the patients may preferably be treated as “nursing home residents” and thus be given a 20 µg vitamin D supplement and 800-1,000 mg calcium daily.

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TRIAL REGISTRATION: not relevant.
– Are the 25-OHD levels of psychiatric patients at admission lower than those of the background population?
– Are the 25-OHD levels of patients with a mood (affective) disorder (International Classification of Diseases (ICD)-10: F30-39 diagnosis) lower than those of patients with other psychiatric diagnoses?
– Is there a difference in 25-OHD level between men and women or between age groups?
– Due to the cost of the analysis: Is it possible to establish a “marker” for the 25-OHD value if a correlation is found between 25-OHD and either Ca²⁺, TSH or cobalamine – three other routine laboratory analyses?

MATERIAL AND METHODS
This retrospective, cross-sectional study included patients admitted for hospitalisation at the PCF during the period from 25 May to 9 September 2010. The study included a total of 232 blood samples. The study was approved by the Danish Data Protection Agency and The Danish Health Authorities.

Plasma-25-OHD concentration was analysed using a validated electrochemiluminescence competitive immunoassay with a measurement interval of 25-250 nmol/l. (The method reported results as “< 25 nmol/l” for all results below 25 nmol/l).

According to the Danish health authorities, the 25-OHD concentration reference intervals are as follows:

- Severe deficiency: < 12 nmol/l
- Moderate deficiency: 12-25 nmol/l
- Insufficiency: 25-50 nmol/l
- Normal: > 50 nmol/l

Furthermore, patients were categorised into three ICD-10 diagnosis groups: F20-29, F30-39 and “others”.

Study population
The 232 blood samples included 61 re-admissions (a total of 45 patients were re-admitted 1-4 times in the study period). Only samples from the first admission were included, as it was assumed that patients would be treated with vitamin D in cases where results showed an abnormal value. One patient did not have a 25-OHD analysis performed at admission. The study population therefore consisted of 170 patients and the corresponding 25-OHD results from their first admission. No patients were treated with a prescribed vitamin D supplement prior to their first admission.

Statistical analysis
Age and concentrations of 25-OHD, serum calcium, serum TSH and serum cobalamine were tested for normal distribution using the Shapiro-Wilk normality test. Only serum calcium data were normally distributed. The Kruskal-Wallis rank sum test was used to test for correlation. The χ²-test was used to test categorised data. 25-OHD data “< 25” were included in the analysis as “25” and serum cobalamine “> 1,480” as “1,480”.

Trial registration: not relevant.

RESULTS
Of the 170 patients, 55% (n = 93) were women and 45% (n = 77) were men.

Thirteen patients (8%) had severe to moderate 25-OHD deficiency, 59 (34%) had insufficiency and values were normal in 98 (58%). In total, 42% of the results were abnormal.

There were no statistical differences between sexes, age or diagnose groups. An extended statistical analysis was carried out on the age (not categorised) and the corresponding 25-OHD value, and no statistical difference was found (p = 0.7). No correlation was found between 25-OHD and cobalamine, TSH or Ca²⁺.

DISCUSSION
In a review paper from 2005 [6], vitamin D status was presented for various Danish population groups. Among healthy blood donors, 0% had severe deficiency, 18% had moderate deficiency and 42% had insufficiency during winter time. In the summer period the corresponding shares were 0, 0 and 4%, respectively. For older people (66-88 years, living at home) the respective values – all year – were 12, 19 and 47%.
In this study it was found that 42% of all admitted patients had an abnormal 25-OHD level during a period of three summer months. This is a high frequency compared with the 4% found in blood donors \( (p = 0.0001, \chi^2 = 81.187) \) (Figure 1). The 25-OHD levels in psychiatric patients during summer are therefore comparable to those of healthy blood donors in winter time.

Recent studies [7, 8] support the findings that vitamin D deficiency is prevalent in an unselected in-patient psychiatric population. In a more selected group of psychiatric patients [9], it was shown that vitamin D levels were lower in patients with schizophrenia than in patients with depression and in healthy controls. Associations between depression and low vitamin D levels have been identified in a recently published clinical review article [10]. However, no studies have yet clarified whether vitamin D deficiency is an antecedent cause, a correlate or a consequence of depression. A randomised, prospective, controlled clinical trial is warranted to document any effect. Such a study is currently ongoing in Region South Denmark in patients with unipolar depression.

The 25-OHD analysis is costly (up to 400 DKK) and it should be possible to identify the patients at risk of 25-OHD deficiency or insufficiency from the patient history, i.e. geographical or lifestyle issues, and then only to perform the test on these patients. This procedure is also recommended by Parker & Brotchie [10]. A daily vitamin D supplement of 10 µg given to all high-risk patients may be considered, even without actually knowing their exact 25-OHD levels. Furthermore, these patients should be treated as recommended by the Danish Health and Medicines Authority [11].

CONCLUSION

No evidence was found for measuring 25-OHD concentration in subgroups of patients related to sex, age or diagnosis group. A total of 42% of the patients admitted to the psychiatric ward during a summer period had an abnormal 25-OHD level. It should be possible from the patient history to identify the patients at risk of 25-OHD deficiency or insufficiency, and then to only perform the test on these patients. A daily vitamin D supplement of 10 µg given to all high-risk patients may be considered, even without actually knowing their exact 25-OHD levels. Furthermore, these patients should be treated as recommended by the Danish Health and Medicines Authority [11].