

# Prevalence of Vitamin D Deficiency in an Inpatient Forensic Intellectual Disability Service

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# Introduction

- \* During the last decade, there has been much public interest in the high level of vitamin D deficiency being reported worldwide (Holick, 2010).
- \* Vitamin D is known as the 'sunshine' vitamin, as approximately 90% is produced through skin exposure to sunlight from ultraviolet B rays, with only a small amount obtained through food sources (Moyer, 2008).
- \* People living within the United Kingdom and other countries in northern latitudes struggle to sustain adequate levels of vitamin D due to insufficient solar radiation in the winter months (Huotari and Herzig, 2008).
- \* Pearce and Cheetham (2010) highlight that more than 50% of the UK adult population have insufficient levels of vitamin D and that 16% have severe deficiency during winter and spring, with the highest rates in Scotland, northern England and Northern Ireland.

# Complications of Vitamin D deficiency

- \* Low vitamin D levels can lead to skeletal complications such as rickets in children, osteomalacia and osteoporosis in adults, with increased risk of fractures.
- \* Low levels of vitamin D are associated with extra-skeletal disorders (e.g. autoimmune, cardiovascular, metabolic disorders, cancer, dementia) (Perry, 2014).
- \* Patients with low levels of vitamin D can present asymptomatic or have vague and nonspecific symptoms like muscle pain/spasms, muscle weakness, fatigue, low energy levels, sleep disturbance, weight gain, poor concentration, poor gum health, stomach problems, palpitations, low mood, hair loss and susceptibility to infections which can impact quality of life (Khan and Fabian, 2010).

# Vitamin D and Developmental Disability

- \* People with ID can be at particular risk of vitamin D deficiency, particularly those with mobility issues, obesity, a history of treatment with psychotropic or anticonvulsant medication or a history of being in hospital or supported community settings.
- \* Frighi and colleagues (2014) compared the vitamin D levels of 155 patients with intellectual disability under psychiatric care in the community and a control group of 192 people from the same geographical area.
- \* Approximately twice those with intellectual disabilities were deficient compared to the control group (77.3% vs. 39.6%), and the deficiency was more severe. The authors attributed insufficient exposure to sunlight as the main reason for the difference, with patients with poor mobility experiencing vitamin D levels almost 50% lower than those with normal mobility.
- \* Kilpinen-Louisa et al. (2009) investigated bone health and vitamin D status in 138 institutionalized adults with intellectual disability in southern Finland. Vitamin D insufficiency and deficiency was common, with 77% of adults experiencing deficiency.

# Vitamin D and Mental Health

- \* Individuals with mental health problems also appear to be at risk of vitamin D deficiency due to poor dietary intake and limited access to adequate sunlight (Penckofer et al., 2010).
- \* One study reported that of 132 psychiatric inpatients in New Zealand, 75% had mild deficiency and 19% had severe deficiency (Menkes et al., 2012). The authors' explanations for this included the latitude, variations in the seasons, high use of sun cream during the summer months, darker skin pigmentation and lack of compulsory fortification of vitamin D in food sources.

# Vitamin D and Forensic Mental Health

- \* Studies have examined the vitamin D levels in forensic mental health inpatients.
- \* Murie et al. (2012) screened 33 male patients in a high secure psychiatric unit. Of these, 36% were insufficient and 58% deficient in vitamin D. Only two participants had adequate vitamin D levels.
- \* Every-Palmer and Souter (2014) found low vitamin D levels among 95% of 21 psychiatric inpatients within a forensic service in New Zealand.
- \* The authors concluded that low vitamin D levels were ubiquitous, with a concerning prevalence of deficiency, and reiterated the need for routine supplementation in psychiatric inpatient populations, alongside focusing on outdoor recreation time and healthy diet.

# Summary

- \* This population are at increased likelihood of developing vitamin D deficiency due to the presence of a number of risk factors – intellectual disability, inpatient status, high rates of mental disorder, obesity and anticonvulsant medication.
- \* Guidance recommends all people living within inpatient environments are routinely screened for vitamin D deficiency and offered treatment where appropriate (NICE, 2014a).

# Aim

- \* Due to this, baseline assessment of Vitamin D level monitoring (and treatment if indicated) was introduced into routine clinical practice within a forensic intellectual disability service.
- \* The present study aims to evaluate baseline vitamin D levels of inpatients within a forensic intellectual disability service and to examine the levels of deficient or insufficient patients following supplement treatment.

Article

## Vitamin D deficiency in an inpatient forensic intellectual disability service

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### Abstract

No research has examined vitamin D deficiency among inpatients within forensic intellectual disability services, despite their potentially increased risk. Tests of serum 25(OH)D concentration in blood are routinely offered to patients within the service as part of the admission and annual physical health check. Results were classified as deficient <25, insufficient <50, sufficient 50–75 or optimal >75. Deficient or insufficient patients were offered supplement treatment and retested within 6 months. Levels were compared between groups: level of security and gender. At baseline, 87% of patients were deficient or insufficient, whilst 13% were sufficient or optimal. At follow-up, 53% had sufficient or optimal levels. However, some patients remained deficient (13%) or insufficient (34%) due to non-compliance with treatment. Women appeared more likely to be deficient. High levels of vitamin D deficiency were found among this population. Vitamin D screening and treatment is a simple and effective way of improving the physical health of this population.



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# Method - Participants

- \* Participants were inpatients from the medium and low secure wards of a 95-bed specialist intellectual disability forensic service.
- \* At baseline, 84 patients were tested (38 women and 46 men).
- \* At the time of the audit, 30 patients had received their 6-month follow-up test (16 women and 14 men).
- \* Some patients were lost to follow-up due to being discharged (n ¼ 19), whilst 27 patients were not yet due for their 6-month follow-up, and 8 did not require a retest as they were not deficient or insufficient at baseline.

# Method - Measures and procedure

- \* Tests of serum 25(OHD) concentration in blood are routinely offered to patients within the service as part of the admission and annual physical health check.
- \* Baseline and follow-up 25(OHD) tests were obtained from case notes.
- \* Treatment was offered by the general practitioner (GP) if a patient was identified as deficient or insufficient, following the local primary care pathway for the treatment of vitamin D deficiency in adults (West Suffolk Clinical Commissioning Group, 2015).

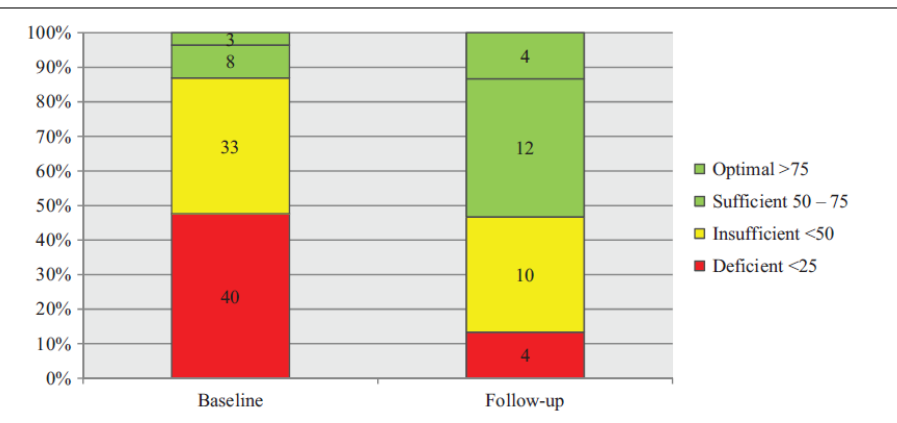
# Method – Treatment

\* Vitamin D levels are classified by the following four categories:

- \* deficient <25
- \* insufficient <50
- \* sufficient 50–75 and
- \* optimal >75

- \* If patients were found to be deficient, they were offered high-dose supplements for 2 weeks:
- \* Biovitamin D3 20,000 unit capsules (vitamin D<sub>3</sub>; cholecalciferol). This was followed by ongoing Calceos 500 mg/400 IU supplements: 1000 units daily, where 25(OHD) level was closer to 50 nmol/L, or 2000 units daily, where 25(OHD) level was closer to 25 nmol/L. If found insufficient, patients were given Calceos only.
- \* Deficient or insufficient patients were also given lifestyle advice by the practice nurse and GP, such as accessing safe sun exposure, dietary sources of vitamin D and compliance with their vitamin D supplements.

# Results



- \* The majority of patients assessed at baseline were either: insufficient (n = 33, 39%) or deficient (n = 40, 48%).
- \* Only a minority of patients had sufficient (n = 8, 9%) or optimal levels (n = 3, 4%).
- \* At the 6-month follow-up, 53% of patients retested had moved into the sufficient (n = 12, 40%) or optimal categories (n = 4, 13%), although 47% of patients retested were insufficient (n = 10, 34%) or deficient (n = 4, 13%).
- \* All of these patients had declined to take or had poor compliance with their vitamin D supplements.

# Between group differences

## **Gender**

Women had significantly lower levels of vitamin D than men at baseline, but there were no significant differences at the follow-up.

## **Level of Security**

There were no significant differences in vitamin D levels between patients within low or medium secure services, at baseline or at follow-up.

## **Ethnicity**

Could not be examined due to the majority (89.3%) being White British.

# Discussion

- \* This study found that a significant majority of patients assessed at baseline were either vitamin D deficient or insufficient (87%), with only 13% having sufficient or optimal levels.
- \* Although the present study did not have a control group, rates of deficiency were considerably higher than that of the UK general population.
- \* NICE (2014) reports that approximately 1 in 5 adults have low vitamin D status, whilst in the present population 1 in 2 had vitamin D deficiency and 9 in 10 had either deficiency or insufficiency.

# Are these findings replicated?

- \* These findings are not isolated to our service/study and have been reported by our colleagues in the North East in a high quality study separating new admissions and current patients, and including multiple cohorts.
- \* This further illustrates the need to have comprehensive screening and treatment programmes in place in inpatient settings.

## ORIGINAL PAPER

### Vitamin D in patients with intellectual and developmental disability in secure in-patient services in the North of England, UK

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**Aims and method** To assess the benefits of the introduction of routine vitamin D serum sampling for all patients admitted to a secure in-patient hospital in the North of England providing medium security, low security and rehabilitation services for offenders with intellectual and developmental disability. The vitamin D levels of 100 patients were analysed at baseline. Those with insufficient or deficient levels were offered treatment and retested after 1 year. Vitamin D levels were analysed in the context of level of security, seasonality of test and co-prescription of psychotropic medications.

**Results** Eighty-three per cent of patients had suboptimal vitamin D levels at initial test (41% deficient and 42% insufficient). This was seen among established patients and new admissions. Regression analysis of baseline vitamin D levels revealed no differences for levels of security, seasonality, whether patients were taking antipsychotic or anticonvulsant medication, or length of stay. Patients with deficiency or insufficiency were all offered supplementation. Those who opted in had significantly higher vitamin D levels at follow-up, compared with those who declined treatment.

**Clinical implications** Established and newly admitted patients in our secure mental health services had substantial levels of vitamin D insufficiency. In the light of the morbidities that are associated with deficient vitamin D levels, routine screening and the offer of supplementation is advisable.

**Declaration of interest** None.

# Conclusion

- \* This study highlights high rates of vitamin D deficiency among a forensic intellectual disability population.
- \* It is therefore recommended that all providers of services for this at risk population should implement similar screening and treatment programmes as well as developing other practices that are supportive of vitamin D levels, such as providing activities within the outdoor areas of the secure service perimeter.
- \* This patient population is at increased risk of poor health due to conditions associated with intellectual disability (Emerson and Baines, 2011) and well-documented difficulties in people with intellectual disabilities and mental disorders accessing good-quality healthcare (Kemp et al., 2014; Tuffrey-Wijne et al., 2014).
- \* Improving vitamin D levels may be one small way in which physical health can be improved among this population.



# Any Questions?

Article

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