SCHIZOPHRENIA, VITAMIN D AND RICKETS - IS THERE A RELATIONSHIP?

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OBJECTIVES

To review if there is any role of vitamin D in the pathophysiology of schizophrenia, based on a clinical case.

BACKGROUND AND AIMS

Vitamin D is a fat soluble vitamin as well as a hormone precursor that plays an important role in bone metabolism and seems to have some anti-inflammatory and immune-modulating properties¹. Vitamin D deficiency is a global issue, with 14% of the world population experiencing low vitamin D levels¹. This vitamin has been usually associated with bone disorders such as rickets, osteomalacia, and osteoporosis¹.

Vitamin D is crucial not only for the osteoarticular system, but also for brain development and functioning. Given the hypothesis of the neurodevelopment of schizophrenia², the importance of genetic and environmental factors (such as vitamin D deficiency) in the etiopathogenesis of this disease is increasingly being highlighted.

Vitamin D receptor is widely expressed in human brain being most abundant in the hypothalamus and substantia nigra³ and vitamin D deficiency has been associated to a range of many neuropsychiatric diseases, such as depression, Parkinson disease, autism and schizophrenia². One accepted theory is that low vitamin D during pre and perinatal periods imprints on several tissues, leading to an increased risk of certain diseases (in addition to genetic and environmental factors)². Animal models have shown that vitamin D receptors are directly involved in the regulation of dopaminergic associated genes expression, which in turn affect dopamine production^{1,2}, but there might be other mechanisms involved.

The authors present a case of a patient diagnosed with rickets and late-onset schizophrenia, exploring the potential relationships between these diagnoses.

61-year-old female patient, with a diagnosis of Congenital Hypophosphatemic Rickets.

Two hospitalizations in Psychiatry, the first at 50 y.o. and the second at 61 y.o, manifesting

- ❖ Persecutory delusions
- ❖ Somatic passivity phenomena
- ❖ Cenesthetic hallucinations
- ❖ Functional and labor decline
- ❖ Social isolation
- ❖ No return to premorbid functioning
- ❖ Vitamin D level 10 ng/ml (> 30 ng/ml)

The patient is being seen in psychiatric consultation with the diagnosis of schizophrenia and is stable under long-acting injectable antipsychotic and oral Colecalciferol (vit D3) supplementation

MATERIALS AND METHODS

Clinical case description and non-systematic review of the literature published in the Pubmed / Medline database, using the following keywords: “schizophrenia”, “psychosis”, “rickets” and “vitamin D deficiency”.

RESULTS AND CONCLUSIONS

The hypothesis that vitamin D deficiency is involved in the pathophysiology of schizophrenia correlates with the fact that individuals

- i. born in winter and spring months,
 - ii. living in countries at higher latitudes;
 - iii. living in urban areas;
 - iv. migrants at an early age to countries with colder climates
- are at greater risk of developing schizophrenia^{2,4}.

The common denominator, according to the literature, is a lower maternal serum vitamin D concentration. The biological mechanism is most likely related to vitamin D's action on the regulation of inflammatory and immunological processes, consequently affecting the manifestation of clinical symptoms later in life¹. If hypovitaminosis D is extended to childhood, it can be predicted that children with rickets may have a higher risk of developing schizophrenia.

The etiologic basis of psychotic disorders remains largely unclarified, despite several proposed genetic, neurodevelopmental, and environmental causative factors⁴. According to the literature, more research will be needed to determine the role of vitamin D deficiency as a mediator of psychosis. As with so many other presumed associations of vitamin D and different maladies, there is still no clear consensus that vitamin D improves or is related to mental health¹. Given that most studies on this subject are cross-sectional, a causal relationship is difficult to determine.

Environmental risk modifying factors need special attention, as their further clarification may provide some preventive measures for the reduction of the severity of illness^{4,5}.

Sources:

1 - Lerner PP, Sharony L, Miodownik C. Association between mental disorders, cognitive disturbances and vitamin D serum level: Current state. Clin Nutr ESPEN. 2018 Feb;23:89-102

2 - Samoes, B. and Silveira, C. (2018). The Role of Vitamin D in the Pathophysiology of Schizophrenia. Neuropsychiatry, 07(04)

3 - Ikonen, H., et al. (2019). Vitamin D status and correlates of low vitamin D in schizophrenia, other psychoses and non-psychotic depression – The Northern Finland Birth Cohort 1966 study. Psychiatry Research

4 - Ozer S, et al. Is vitamin D hypothesis for schizophrenia valid? Independent segregation of psychosis in a family with vitamin-D-dependent rickets type IIA. Prog Neuropsychopharmacol Biol Psychiatry. 2004 Mar;28(2):255-66

5 - Coentre, R. and Canelas da Silva, I. (2019). Symptomatic Correlates of Vitamin D Deficiency in First-Episode Psychosis. Psychiatry Journal, 2019, pp.1-7