INTRODUCTION: Vitamin D deficiency is a common problem in many countries. Hypovitaminosis D is more prominent in winter, in high latitudes, and in individuals with dark skin. Migrants to European countries are reported to have a higher risk of hypovitaminosis D compared with native-born people, and immigrants from Turkey have a roughly 4-fold risk of hypovitaminosis D. Vitamin D deficiency is found to increase the risk of developing schizophrenia both in animal models (e.g., the litter of D vitamin-depleted female pregnant rats) or in humans. A growing body of literature is related with vitamin D status and risk of brain disorders including schizophrenia or psychosis.

Low level of vitamin D is suspected as an important contributing factor to the development of cardiovascular diseases, hypertension, metabolic syndrome, and type 2 diabetes mellitus. Although the relation between vitamin D and insulin resistance seems controversial, the Vit D deficiency is considered to be a risk factor for MetS and type 2 DM (4) and glucose intolerance. Cui et al. have shown a positive correlation of vitamin D concentration and insulin sensitivity and suggested that individuals with hypovitaminosis D are at higher risk of insulin resistance and metabolic syndrome. Here, for the first time, we aimed to investigate the association between Vit D3 level and insulin resistance and metabolic syndrome parameters in patients with schizophrenia.

METHOD:

Participants: This study was performed at the Department of Psychiatry of Cerrahpasa Medical School, Istanbul University. We recruited 40 patients with acute schizophrenia who had been admitted to our inpatient clinic between October 2014 and December 2014. The forty inpatients (F=24, M=16) were enrolled in the study after they met the diagnosis of schizophrenia, schizoaffective disorder, and schizophreniform disorder according to DSM IV, TR. The mean age was 41.55±16.29 years and the mean onset age of illness was 30.08±14.21 years and the mean duration of illness 11.50±9.98 years.

The clinical psychopathology in patients was assessed by Positive and Negative Syndrome Scale (PANSS). Individuals were excluded if they had a diagnosis of alcohol or substance dependence, organic mental disorder or learning disability, or a metabolic disease that may affect serum vitamin D concentrations.

After receiving patients' informed consent, 5 cm³ peripheral fasting venous blood samples were taken, placed in tubes covered with aluminum foil and centrifuged at 4000 rpm for 10 min to analyze the separated serum. Hemolyzed and icteric serums were not used in this study. The total vitamin D (25-hydroxyvitamin D) values were measured by electroluminescence. A sufficient level of total vitamin D was considered >60 ng/ml; an insufficient level 30-59 ng/ml; and a deficient level was established as <29 ng/ml. The metabolic syndrome parameters were assessed according to the international diabetes federation: IDF waist circumference, M>94cm / F>80cm; blood pressure, systolic ≥130 mmHg and diastolic ≥85 mmHg; HDL, M<40mg/dl and F<50mg/dl; triglycerides ≥150 mg/dl; fasting glucose, ≥110 mg/dl.

In insulin levels were measured using the Abbott C-2000i device, and glucose and lipid levels were measured using the Abbott C 8000 device. HOMA IR is calculated as: Fasting glucose X insulin / 405, and the patient was accepted as insulin-resisted if the result was >2.5.

Statistical Analysis: Statistical Package for the Social Sciences (SPSS) 20.0 was used for the analysis. While descriptive statistics for continuous variables were shown as mean±SD, categorical variables were expressed as number of cases (n) and % The Mann–Whitney U test was used for nonparametric variables. The Spearman correlation test was used to determine the association between the continuous nonparametric variables. The results were evaluated for a significance level of p<0.05.

RESULTS: There were 26 patients with schizophrenia, nine patients with schizoaffective disorder and four patients with schizophreniform in the sample (n=40 in total). The mean positive symptom scale score was 16.22±4.79 points, the mean negative symptom scale score was 14.55±4.33 points, and the mean general psychopathology scale score was 26.03±6.17. There were no significant differences between patients with insulin-resistant schizophrenia and non-insulin-resistant patients between positive symptom scale (p=0.248), negative symptom scale (p=0.964) and general psychopathology scale (p=0.952).

The mean vitD3 level was 13.03±13.31 nmol/L and 92.5% of patients had insufficient vitD3 (cut-off <30 nmol/L). Three patients met the criteria of metabolic syndrome and the mean metabolic syndrome parameter was 1.45±0.81. The mean HOMAIR was 2.18±1.85. The mean vitamin D3 level was negatively correlated with BMI (r=-0.361, p=0.026), mean systolic blood pressure (r=-0.347, p=0.031). The mean insulin resistance index was positively correlated with BMI (r=0.337, p=0.038) and systolic blood pressure...
(r=0.366, p=0.020), while it was negatively correlated with HDL (r=-0.441, p=0.004).

**CONCLUSION:** In this study, conspicuously we have found a vitamin deficiency/insufficiency prevalence of 92.5% in inpatients with schizophrenia in the acute phase. In a recently published meta-analysis, the prevalence of vitamin D deficiency in schizophrenic patients was calculated as 65.3% (95% CI 46.4%-84.2%)\(^6\). In a new study from Turkey (n=40), 95% of the patients with acute phase schizophrenia had vitamin D insufficiency and/or deficiency\(^7\), while vitamin D deficiency is 2.99-fold higher in first episode psychosis than in healthy controls\(^8\).

In the literature, vitamin D deficiency is accepted as a risk factor for MetS and type2 diabetes\(^4\). Vitamin D receptors are found to be expressed in pancreatic B cells and target tissues of insulin, such as hepatic, adipose, and muscle tissues\(^9\). Unexpectedly, we could not find an association between vit D3 level and insulin resistance, while lower vit D 3 leads to higher BMI and positive symptoms in patients with schizophrenia. Generally, there exists an inverse association between body mass index (BMI) and serum 25-hydroxyvitamin D\(^4\), while the association between vitamin D and insulin resistance is yet controversial\(^9\). Interestingly, the more insulin resistance index the higher are BMI and systolic pressure and the lower the HDL level detected in patients with schizophrenia. Thus, although vit D3 and insulin resistance were not correlated in this study, both seem to be important in schizophrenia. We considered that low serum vitamin D level seems to be related with psychopathology in schizophrenia, and insulin resistance seems to be related with metabolic parameters in a distinctive way.

**Keywords:** vit D, schizophrenia, insulin resistance, metabolic syndrome

**References:**

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