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Original Research Article

ANALYSIS OF PREVALENCE OF COBALAMINS AND FOLATE DEFICIENCY AMONGST ADOLESCENTS: AN INSTITUTIONAL BASED STUDY

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ABSTRACT

Background: Among micronutrients, vitamin B12 (B12) and folate (FA) are critical as they are required in a plethora of metabolic and biological functions. Hence, the present study was conducted for assessing the prevalence of cobalamins and folate deficiency amongst adolescents.

Materials & Methods: A total of 500 adolescents were enrolled. Complete demographic and clinical details of all the patients were obtained. A proforma was made, and detailed clinical profile was evaluated. Blood samples were obtained, and serum cobalamin and folate levels were evaluated.

Results: A total of 500 adolescents were evaluated. The mean age of the patients was 12.3 years. Prevalence of cobalamins and Prevalence of folate deficiency was 31.8 percent and 28.5 percent respectively. Among boys, cobalamins deficiency was seen in 89 patients while folate deficiency was seen in 63 patients. Among girls, cobalamins deficiency was seen in 70 patients while folate deficiency was seen in 79 patients. Non-significant results were obtained while correlating prevalence of cobalamins and folate deficiency among boys and girls.

Conclusion: Our results demonstrate a high prevalence of folate and cobalamin deficiency among adolescents.

Key words: Folate, Cobalamin.

INTRODUCTION

Among micronutrients, vitamin B12 (B12) and folate (FA) are critical as they are required in a plethora of metabolic and biological functions. B12 and FA have overlapping biological functions in DNA synthesis and the development of red blood cells (RBC) and the myelin sheath, which are essential for normal growth and development. One central pathway for both is the methyl transfer reaction in the methionine cycle, which converts homocysteine (Hcy) to methionine. Folate is engaged in many methylation reactions covering DNA, proteins, phospholipids and neurotransmitter metabolism. B12 is only found in animal-source foods such as meat, poultry, fish and dairy products, while folate is abundant in both animal and plant foods.[1-3]

Folate deficiency in the periconceptional period contributes to neural tube defects; deficits in vitamin B12 (cobalamin) have negative consequences on the developing brain during infancy; and deficits of both vitamins are associated with a greater risk of depression during adulthood.[4] Hence; the present study was conducted for assessing the prevalence of cobalamins and folate deficiency amongst adolescents.

MATERIAL AND METHODS

The present study was conducted to assess the prevalence of cobalamins and folate deficiency amongst adolescents.

A total of 500 adolescents were enrolled. Complete demographic and clinical details of all the patients were obtained. A proforma was made, and detailed

clinical profile was evaluated. Blood samples were obtained, and serum cobalamin and folate levels were evaluated.

According to the criteria set by the World Health Organization (WHO), B12 deficiency is defined as having a serum B12 level below 203 pg/mL, whereas folate (FA) insufficiency is defined as having erythrocyte FA levels below 151 ng/mL. All the results were recorded in Microsoft excel sheet and were subjected to statistical analyses sing SPSS software.

RESULTS

A total of 500 adolescents were evaluated. The mean age of the patients was 12.3 years. Prevalence of cobalamins and Prevalence of folate deficiency was 31.8 percent and 28.5 percent respectively. Among boys, cobalamins deficiency was seen in 89 patients while folate deficiency was seen in 63 patients. Among girls, cobalamins deficiency was seen in 70 patients while folate deficiency was seen in 79 patients. Non-significant results were obtained while correlating prevalence of cobalamins and folate deficiency among boys and girls.

Table 1: Prevalence of cobalamins and folate deficiency

Variable	Number	Percentage
Prevalence of cobalamins deficiency	159	31.8
Prevalence of folate deficiency	142	28.5

Table 2: Correlation of cobalamins and folate deficiency among two study groups

Variable	Boys (n=263)	Girls (n=237)	p-value
Prevalence of cobalamins deficiency	**89**	**70**	**0.12**
Prevalence of folate deficiency	**63**	**79**	**0.33**

DISCUSSION

Cobalamin and folate are required during the period of rapid growth of infancy and childhood. Together or individually, their deficiency during early childhood can lead to poor growth, proneness to infection, irreversible neurological damage to the developing brain, impairment in memory, compromised cognition, poor school performance, reduced work capacity, and stunting. Their deficiency can have nonspecific manifestations like delaying development and growth, weakness, and irritability. Permanent neurologic damage may occur if left untreated. Different kinds of irreversible neurological damage among children, e.g., developmental regression, microcephaly, apathy, hypotonia, hypokinesia, etc., have been reported in the literature.[6-9]

A total of 500 adolescents were evaluated. The mean age of the patients was 12.3 years. Prevalence of cobalamins and Prevalence of folate deficiency was 31.8 percent and 28.5 percent respectively. Among boys, cobalamins deficiency was seen in 89 patients while folate deficiency was seen in 63 patients. Among girls, cobalamins deficiency was seen in 70 patients while folate deficiency was seen in 79 patients. Non-significant results were obtained while correlating prevalence of cobalamins and folate deficiency among boys and girls. Kreusler P et al proposed age- and sex-specific percentiles for serum cobalamin and folate, and analyzes the effects of sex, age, body mass index (BMI), and socioeconomic status (SES) on cobalamin and folate concentrations in healthy children and adolescents. In total, 4478 serum samples provided by healthy participants in the LIFE (Leipzig Research Centre for Civilization Diseases) Child population-based cohort study between 2011 and 2015 were analyzed by electrochemiluminescence immunoassay (ECLIA). Female sex was associated with higher concentrations of both vitamins in 13- to 18-year-olds and with higher folate levels in one- to five-year-olds. BMI was inversely correlated with concentrations of both vitamins, whilst SES positively affected folate but not cobalamin concentrations. To conclude, in the assessment of cobalamin and folate status, the age- and sex-dependent dynamic of the respective serum concentrations must be considered. While BMI is a determinant of both vitamin concentrations, SES is only associated with folate concentrations.[9]

Shalini T et al assessed the prevalence of Vitamin B12 and Folate Deficiencies in Indian Children and Adolescents. The recent Comprehensive National Nutrition Survey (CNNS-2016-18) provided estimates of the prevalence of B12 and FA deficiency at the national and state levels among preschool, school-age children and adolescents. Serum B12 and erythrocyte FA were measured by the direct chemiluminescence method, and their deficiency was defined using WHO cut-offs. The prevalence of B12 and FA deficiency was high among adolescents compared to school-age and preschool children. The prevalence of both B12 and FA deficiency was significantly higher by 8% and 5%, respectively, in adolescent boys compared to girls. There was no association between anthropometric undernutrition and B12 and FA deficiency. There was wide regional variation in the prevalence of B12 and FA deficiency, but no rural–urban differences were observed across all age groups. The national prevalence of B12 deficiency among preschool or school-age children was <20%. However, FA deficiency in these age groups and

both FA and B12 deficiencies in adolescents were >20%, warranting further investigation.[10] Kapil U et al assessed the magnitude of folate, ferritin, and cobalamin deficiencies amongst adolescent of 11-18 years of age in National Capital Territory (NCT) of Delhi, India. About 347 adolescents belonging to low- (LIG), middle- (MIG), and high-income groups (HIG) were selected using the probability proportionate to size (PPS) sampling methodology. Serum ferritin, serum folate, and serum cobalamin levels were determined by the enzyme-linked immunosorbent assay (ELISA) method, radioimmunoassay (RIA) method, and radioisotopic method, respectively. Hemoglobin (Hb) estimation was done by cyanmethemoglobin method in all the blood samples collected. The prevalence of deficiency of ferritin in HIG, MIG, and LIG categories of adolescent was found to be 52.9, 67, and 58.8%, respectively. In the HIG, MIG, and LIG categories of adolescents, the prevalence of folate deficiency was 22.5, 40.4, and 52.2%, respectively. The prevalence of deficiency of cobalamin in HIG, MIG, and LIG categories of adolescent was 47.1, 80.7 and 87.5%, respectively. About 48, 66.1, and 68.4% of adolescents in the HIG, MIG, and LIG categories, respectively had Hb levels less than 12 g/dL and were found to be suffering from anemia. A high prevalence of anemia existed along with deficiency of ferritin, cobalamin, and folate amongst adolescent.[11]

CONCLUSION

Our results demonstrate a high prevalence of folate and cobalamin deficiency among adolescents.

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