

Assessment of Calcium-Phosphorus Metabolism in Preschool Children

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Annotation. Early childhood caries (RDC) is growing in many countries and has become a serious health problem, especially among socially disadvantaged segments of the population. ECC is defined as the presence of one or more destroyed, missing or sealed tooth surfaces in any baby tooth in a child aged 71 months or younger. It has several unique clinical characteristics, such as the rapid development of caries, which affects a number of teeth shortly after their appearance in the oral cavity. These lesions affect the surfaces of the teeth, which are less prone to developing caries. Several terms have been used to describe the condition, such as bottle caries, feeding caries, unbridled caries, bottle caries, bottle caries, milk bottle syndrome and long-term caries of breastfeeding habits. ECC is a multifactorial disease that occurs as a result of the interaction of factors including cariesogenic microorganisms, exposure to fermentable carbohydrates due to malnutrition and a number of social variables. ECC is a severe health condition found in children living in socially disadvantaged communities in which malnutrition represents social and health inequalities. ECC is associated with other health problems ranging from local pain, infections, abscesses leading to difficulty chewing, malnutrition, gastrointestinal disorders and sleep problems.

Keywords: Early childhood, bottle caries, the interaction of factors, unbridled caries.

Introduction

When analyzing all the results, the average Ca concentration was significantly higher in children with an optimal concentration of 25(OH)D3 compared with children with a deficiency of 25(OH)D3 ($p < 0.05$). Samples taken from children under the age of 4 years revealed significantly higher average concentrations of Ca and Pi in children with an optimal concentration of 25(OH)D3 compared with children with suboptimal levels of 25(OH)D3 ($p = 0.04$; $p = 0.002$, respectively). For all results and for children aged less than 4 years, the concentrations of Ca and Pi positively correlated with the concentration of 25(OH)D3 ($p < 0.002$, $p < 0.01$; $p < 0.003$, $p < 0.004$; respectively). There is no relationship between the concentrations of PTH and 25(OH)D3. Conclusion: Comparing the results of calcium and phosphate concentrations only with the corresponding reference ranges may not be sufficient to assess calcium phosphate metabolism. Probably, the reference values for total calcium and phosphates should be set depending on the level of vitamin D, especially for young children.

Statistical heterogeneity was observed between the three studies (heterogeneity criterion = 14.01, $P = 0.003$, $I^2 = 79\%$). It was assumed that the causes of heterogeneity are gender and menstruation. Therefore, to determine the level of vitamin D in serum, a random effects model was applied and a subgroup analysis was performed. Analysis of the combined data showed that the main group had lower serum vitamin D levels than the control group [MD = -6.74, 95% CI (-9.47, -4.00)]. In female patients, the average vitamin D level in the AIS group and the control group was 17.23 ± 8.71 and 20.96 ± 16.53 ng/ml, respectively. In male patients, the average vitamin D level in the AIS group and the control group was 16.82 ± 7.52 and 21.99 ± 13.27 ng/ml, respectively. In order to focus on the study of female patients, data sets on women were combined. An analysis of the combined data (heterogeneity criterion = 11.20, $P = 0.004$, $I^2 = 82\%$) showed that serum vitamin D levels in the AIS group were lower than in the control group among female patients [MD = -5.97, 95% CI (-7.61, -4.34)]. A random effects model was applied to evaluate the outcome measure, which showed that the AIS group had lower calcium levels than the control group [SMD = -0.77, 95% CI (-1.51, -0.02)]. Meta-analysis showed that there was no statistical difference between the

two groups [SMD = 0.5, 95% CI (-0.46, 0.57)] when using a random effects model.

A meta-regression with random effects was performed to study the relationship between average daily calcium intake and calcium retention concentration in children aged 0-6 months. It should be noted that none of the studies of children aged 6 months to 1 year did not provide enough data for meta-regression. All included studies used mass balance measurements. The results of the meta-regression showed that an increase in average calcium intake for every 10 mg/(kg*day) was associated with an average calcium retention of 4.04 mg/(kg*day) (β -coefficient = 0.404 [95% CI: 0.302, 0.506], $p < 0.0001$). In other words, the average net calcium retention was 40.4% (95% CI: 30.2–50.6%). However, the residual heterogeneity was very large ($I^2 = 86.18\%$, $P < 0.0001$). The physiology of calcium-phosphorus metabolism is complex and is related to bone physiology. Vitamin D is known to help maintain calcium-phosphorus homeostasis. Thus, vitamin D deficiency can lead not only to bone defects, but also to a number of other diseases. Our meta-analysis showed that vitamin D levels in the study group were lower than in the control group. In addition, it was negatively correlated with the Cobb angle. This indicates that vitamin D is associated with the pathogenesis of calcium-phosphorus metabolism disorders, which provides new ideas for further research from both a mechanistic and clinical point of view.

The conducted epidemiological dental study showed that the intensity and prevalence of caries is 45% higher ($p \leq 0.05$, $\chi^2 = 0.7600135$) among the rural population of the Khorezm region than in the city of Urgench itself. The study showed a low level of oral hygiene knowledge among rural residents ($\chi^2 = 0.8100924$, 95% CI=0.8321009, Percentile=0.5219248 at $p < 0.05$) compared with urban residents. Biochemical studies of calcium-phosphorus metabolism in children with early childhood caries revealed correlating low reference values of the total, ionized calcium, phosphorus in the blood and in saliva. The conducted microbiological study showed an increase (by 42%) in cariesogenic bacteria of the oral cavity in residents from rural areas than in residents of the city of Urgench. Conclusion. The developed individual protocols of pathogenetic therapeutic and preventive measures to stabilize early childhood caries in preschool children make it possible in the long term to reduce the increase in the intensity of caries of temporary teeth by 45.7% and increase the effectiveness of operative rehabilitation treatment to 92.7%. The identified risk factors in the form of a deficiency of the nutrient composition of nutrition in preschool children both in terms of basic nutrients and essential mineral components, which in turn contributes to an increase in the intensity of caries of temporary teeth ($r = 0.37$, $p < 0.01$).

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