

CASE REPORT

Detection of serum bone alkaline phosphatase in 77 adolescents

Dingping Shi^{1*} Dafang Wang¹ Yonggang Zheng²

In the fast growing period of adolescent children, bone growth and bone mineralization are extremely active. Adulthood is the second peak of bone development, adolescent appropriate calcium intake into the ideal bone peak to achieve an important role.^[1] It is important to make clear whether or not bone mineralization and to early intervene. Bone alkaline phosphatase (BALP) is the most correct indicator to reflect the whole process of bone change,^[2] 177 Cases of adolescents were detected BALP in 2014 to evaluate the meaning of this measurement .

1 Objects and methods

1.1 Objects

177 Health children aged 12 to 14 years old (84 male cases, 93 female cases) from schools in Beijing, without diseases in heart, liver, kidney, skeletal systems or others.

1.2 Methods

Using the "whole blood dry immune enrichment method Dingbang alkaline phosphatase diagnostic kit"(BALP KIT, Lot number 02050124) developed by Wang Jiayi from Beijing Zhongsheng Engineering high-tech companies. Collected the finger peripheral blood test at the same time .

1.3 Measurements

Lower than 200 nmol / (L° S) is a normal range; 200 to 300 nmol / (L° S) means early bone mineralization; higher than 300 nmol / (L° S) means exciting stage;^[2] higher than 200 nmol / (L° S) means the total number of abnormalities.

2 Results

The total abnormalities of bone alkaline phosphatase in adolescents were 53.1% (94 /177), the total number of males was higher than that of females, the difference was significant (P <0.01). See [Table 1](#).

Table 1. Comparison of BALP values for different genders

Groups	Cases	≤ 200	200-300	≥ 300	Total abnormalities
Male	84	24 (28.6)	37 (44.0)	23 (27.4)	60 (71.4)*
Female	93	59 (63.4)	21 (22.6)	13 (20.0)	34 (36.6)
Total	177	83 (46.9)	58 (32.8)	36 (20.3)	94 (53.1)

Note: $\chi^2 = 34.92$, $P < 0.01$, compared with female

3 Discussion

Bone mass is the amount of mineral deposits in the bone. Most of the accumulation of bone mass occurs in children or adolescents. Adolescent calcium metabolism is different from children and adults, which is in the second peak of accelerated growth. Bone tissue normal growth and development need appropriate calcium intake, especially for young people, this supplementation of calcium can increase the deposition of bone minerals. The amount of bone calcium is 25 to 30 g for new born, account for 1% of body weight, and that is 1200 g in adult bone calcium content, which increased 40 times higher than the newborn.^[1] The accumulation of calcium in the premenstrual bone is 140 to 165 mg/d, adolescence can be as high as 400 to 500 mg/d, this period

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* Correspondence to: Dingping Shi, Department of Pediatrics, Yuquan Hospital, Tsinghua University, Beijing 100049, China; Email: dpshi@163.com

² Department of Clinical Laboratory, Yuquan Hospital, Tsinghua University, Beijing 100049, China

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of intestinal absorption rate is very high, up to 40%.^[3] Increased bone content in young people with long-acting effect, bone containing magnitude and bone loss rate are important for adult fractures and osteoporosis notice parameters.^[3] Mainly happened in adults with bone loss, bone tissue micro-knot degenerative features become osteoporosis, may begin to happen in childhood. Calcium intake is sufficient in childhood, but for adult, osteoporosis or fracture seldom happened,^[1] so it is very important to know more about the amount of normal bone mineralization of adolescents, to promote the healthy growth of bones and prevent adult osteoporosis. The deficiency of pubertal bone mineral is a problem easy to ignore. Most are in subclinical conditions without clinical symptom, and it is difficult to detect, so we randomly screen the BALP for healthy school children.

Vitamin D is closely related to calcium, phosphorus metabolism. Calcium and phosphorus absorption is affected and the bone mineral content is relatively insufficient when vitamin D is deficiency, which result in osteogenesis disorders, bone cell compensatory hyperplasia, osteoblast activity increased, BALP (the main activity of bone calcification substance) increased, plasma BALP levels also increased. So it is believed that serum BALP is the most accurate indicator of the whole process of bone change around the world.^[2] Total activity of Alkaline Phosphatase (ALP) was firstly used to evaluate bone calcification biochemical indicators. The specificity of ALP is poor. Besides the ALP in bone, ALP also exists in liver, gallbladder, intestinal and lung in plasma of children. ALP in liver and gallbladder can be identified by the occurrence of jaundice. The largest interference is from the ALP in intestinal, pulmonary and bone-like ALP.^[2] Although there have been no morphological changes when the amount of BALP increased, there have

been different degree of bone calcification disorder,^[2] especially for healthy children screening. BALP is from bone cell synthesis, and is the most sensitive indicator of bone formation rate, as well as is valuable for bone calcification.^[2] Severe vitamin D deficiency can cause bone mineral abnormal or short. Vitamin D is extremely important to normally metabolised of bone and cartilage during development phase, especially in the fast-growing period of adolescents, vitamin D deficiency can occur with rickets. Adolescence lack of vitamin D can cause pelvic dysplasia.^[3] In this investigation, the results of BALP determination from 177 cases of healthy adolescent showed that more than half of healthy children have bone mineralization in adolescence, the abnormal rate of boy is 71.4% (60 / 80), and the abnormal rate of girl is 36.6% (36/93), which may be resulted from boys being faster growth and development than girls, being stronger than girls, exercise more than the girls, and being lack of calcium.

Therefore, adolescent students should be advised to add milk after class. To those with abnormal BALP, calcium and vitamin D supplement should be advised, meanwhile, should strengthen physical exercise, increase extracurricular activities and expose to the sun more to improve vitamin D.

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