Dietary and Physical Activity Guidelines for Building Strong Bones

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Key Points:

- **Osteoporosis is a condition of low bone mineral density and increased fracture risk that affects over 75 million people and decreases quality of life.**
- **Building bone mineral density requires both bone loading activities like jumping and strength training and adequate dietary intake of nutrients like calcium and Vitamin D.**
- **Bone loading physical activity and dietary habits need to be sustainable in order to maximize bone health and overall long-term health.**

Osteoporosis is the most prevalent bone disorder affecting over 75 million people worldwide and causing over 4.5 million fractures annually in the USA alone.[1] Fractures often lead to disability and loss of function and significantly increase mortality in the elderly.[1] Osteoporosis is defined as a "low bone mineral density (BMD) and micro-architectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk."[1]

Building BMD early in life is vital. Over 90% of BMD accumulates by age 18 and the remainder throughout the early 20s.[1] However, BMD issues often do not become apparent until fractures occur in midlife or later. By then, it is already too late to build BMD so the focus must instead switch to slowing BMD deterioration.

Two important areas to focus on to optimize bone health are physical activity and diet. Physical activity is essential because BMD increases as we load our bones. Activities that load bones include body weight exercises like jumping and weight training. Encouraging kids to engage in an average of 60 minutes of moderate-to-vigorous physical activity every day places adequate load on their bones to encourage BMD formation.[2] Physical activity for kids includes tag, jump rope, play, and organized sports. Adults should participate in formal resistance training 2-3 times a week as well as additional load-bearing activity 3-5 times a week.[1] Along with exercises such as squatting and benching, examples of load-bearing activities include walking, stair-climbing, and tennis (Figure 1).

Figure 1: Exercises that build strong bones include jogging, hiking, stair-climbing, jumping, and tennis.[4]

Essential nutrients for bone health are calcium and Vitamin D; calcium strengthens bones, and Vitamin D is necessary to absorb calcium. Other key nutrients include magnesium, silicon, and Vitamins K and C.[3] Many foods naturally carry these dietary components which are also often found in fortified foods such as orange juice and milk (Table 1).

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Identifying and choosing healthy and enjoyable bone-strengthening activities and diets need to become a daily habit because sustainable habits maximize long-term health. Parents should model this behavior and encourage their kids to adopt healthy habits early so they will carry into their futures and they can reap the benefits of a healthy lifestyle. Since bone health is a major health factor often overlooked until issues arise later in life, it is critical to educate the public and start forming healthy habits early to avoid health issues in the future.

Table 1: Dietary Sources of Key Vitamins and Minerals for Bone Health.[3]

Nutrient	Dietary Sources	Content
Calcium	6 oz. calcium-fortified orange juice	375 mg
	8 oz. milk or yogurt	350 mg
	1.5 oz. cheddar or mozzarella cheese	300 mg
	½ cup spinach, kale, bok choy, mustard or turnip greens	100 mg
	½ cup broccoli, green beans	20 mg
Vitamin D	3 oz. sword fish, salmon	500 IU
	3 oz. canned tuna	150 IU
	8 oz. Vitamin D fortified milk	125 IU
Vitamin K	½ cup cooked kale, collard greens	500 µgm
	1 cup fresh spinach	140 µgm
	½ cup coleslaw or 1 cup blueberries	40 µgm
Magnesium	2 oz. almonds, cashews	160 mg
	Medium baked potato with skin	50 mg
	8 oz. milk	25 mg
Vitamin C	¾ cup orange juice	93 mg
	½ cup cooked broccoli	51 mg
	½ cup cantaloupe	17 mg
Silicon	16 oz. beer	12 mg
	1 serving whole grain cereal, granola, prunes, or apricots	9 mg
	½ cup brown rice, green beans	4 mg

References

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