

Nutritional Aspects of Osteoporosis Care and Treatment
Cynthia Smith, FNP-BC, RN, MSN, CCD
Pars Osteoporosis Clinic, Belpre, Ohio

- 1) Objectives:
 - a) To understand bone growth and development across the lifespan.
 - b) To develop a better understanding of osteoporosis.
 - i) The pathophysiology of osteoporosis.
 - ii) How osteoporosis is diagnosed.
 - iii) The prevalence of osteoporosis in the United States and in WV.
 - iv) Nutritional concerns.
- 2) Types of Bone:
 - a) Cortical bone (80% of the skeleton).
 - i) Makes up the shaft of the long bones and the outer shell of all bones.
 - b) Cancellous (trabecular) bone (20% of the skeleton).
 - i) “Shock absorbing” bone found in the vertebrae (body) and at the end of long bones (femoral neck in particular).
- 3) Bone Growth and Development.
 - a) Bone is a living tissue that is continuously being both built up and torn down (remodeling cycle).
 - b) Every ten years, most of the skeleton has been remodeled.
 - c) Involvement of two types of bone cells in the remodeling process:
 - i) Osteoclasts remove bone.
 - ii) Osteoblasts build bone.
- 4) Peak Bone Mass
 - a) More bone is built up than is destroyed for most individuals until their early 20’s (range 18-25).
 - b) At this point, peak bone mass is reached or the strongest the bones will be.
- 5) Influences on Peak Bone Mass
 - a) Hereditary Influences (70-80% effect)
 - i) Gender
 - ii) Race
 - b) Lifestyle Influences (20-30% effect)
 - i) Smoking
 - ii) Excess intake of ETOH
 - iii) Exercise
 - iv) Fall prevention behaviors
 - v) Nutritional (calcium and vitamin D)

- 6) Changes in Bone Over Time
 - a) Bone is significantly built up during the teenage years.
 - b) Bone mass remains essentially the same until the 30's to 40's.
 - c) Bone loss starts to occur at this point as more bone is broken down than is built up.
 - d) With the onset of menopause, bone loss is accelerated.
 - i) This acceleration can last 5 to 10 years.
 - ii) Some women can lose as much bone during the 5 years after menopause as they gained during their adolescence.
- 7) Osteoporosis:
 - a) "Osteoporosis is a skeletal disorder characterized by compromised bone strength predisposing to an increased risk of fracture. Bone strength reflects the integration of two main features: bone density and bone quality" (U. S. Department of Health and Human Services, 2000).
 - b) Diagnosing osteoporosis:
 - i) Use of the World Health Organization (WHO) classification
 - ii) Having a fragility fracture (low trauma)-a fracture that occurs in a situation where a fracture normally wouldn't have occurred or from a fall from standing height or less.
- 8) Evaluation of Bone Density
 - a) Multiple tests available:
 - i) Peripheral quantitative computed tomography-primarily used in research.
 - ii) Quantitative computed tomography-greater radiation exposure and requires concurrent use of a phantom scan with patient's scan.
 - iii) Quantitative ultrasound-formula required to calculate T-score equivalent.
 - iv) Radiographic absorptiometry x-ray technique of hand which requires specialized equipment.
 - v) Radiogrammetry x-ray technique of hand.
 - vi) Single x-ray absorptiometry-peripheral site measurement requiring the heel or forearm to be immersed in water.
 - vii) Peripheral energy dual x-ray absorptiometry (pDXA)-focused on forearm or heel.
- 9) The Gold Standard: Dual Energy X-ray Absorptiometry (DXA)
 - a) Measures the axial skeleton (spine and hip(s)).
 - b) Can also measure aspects of the peripheral skeleton (forearm).
 - c) Can perform a total body assessment.
 - d) Able to perform a vertebral fracture assessment.
- 10) Acceptance of DXA:
 - a) Low radiation levels.
 - b) DXA (axial) measures area of bone where the impact of bone loss will be seen more quickly.
 - c) Shown to be effective in predicting fracture risk.
 - d) Only method approved by Medicare for follow-up testing.

- 11) T-Score.
 - a) Obtained through DXA testing.
 - b) The T-score compares an individual's bone mineral density to the mean of a young normal reference group. The difference is expressed as a standard deviation score.
- 12) WHO Classification for Postmenopausal Osteoporosis (1994).
 - a) Normal: T-score -1.0 and above.
 - b) Low bone mass (osteopenia): T-score of -1.1 to -2.4.
 - c) Osteoporosis: T-score of -2.5 and below.
 - d) Severe osteoporosis: T-score -2.5 and below with fragility fractures.
- 13) Acceptance of WHO Classification Guidelines:
 - a) Osteoporosis Society of Canada
 - b) International Society for Clinical Densitometry
 - c) National Osteoporosis Foundation
 - d) U. S. Preventative Services Task Force
 - e) *Bone Health and Osteoporosis: A Report of the Surgeon General* (2004).
- 14) Fracture Risk:
 - a) Osteopenia increase the risk of a fracture two-fold while osteoporosis increases the fracture risk four-to-five fold.
- 15) The Most Common Osteoporotic Fracture Sites
 - a) Vertebral (most common)
 - b) Hip (second most common)
 - c) Forearm (Third most common)
- 16) Fracture Estimates:
 - a) After the age of 50, one in two women and one in four men will have a fracture due to osteoporosis.
- 17) Fracture Consequences:
 - a) 20% of patients with a hip fracture die within a year of the fracture due to complications from the fracture.
 - b) One year after a fracture, 40% of patients have trouble walking without help.
 - c) 60% have trouble doing necessary activities of daily living.
 - d) 80% have trouble with some type of activity (IE: driving).
- 18) Prevalence of Osteoporosis:
 - a) Nationally, ten million people have osteoporosis.
 - b) Thirty four million have osteopenia.
- 19) Prevalence of Osteoporosis/Osteopenia in WV:
 - a) 77% of women aged 50 years old and older had either osteopenia or osteoporosis in 2002.
 - b) 44% of males aged 50 years old and older had either osteopenia or osteoporosis in 2002.

20) Nutritional Influences:

- a) Crucial Role of:
 - i) Calcium
 - ii) Vitamin D
 - iii) Other micronutrients

Your body needs calcium.	
<i>If this is your age,</i>	<i>then you need this much calcium each day (mg).</i>
0 to 6 months	210
6 to 12 months	270
1 to 3 years	500
4 to 8 years	800
9 to 18 years	1,300
18 to 50 years	1,000
Over 50 years	1,200

(A cup of milk or fortified orange juice has about 300 mg of calcium.)

U. S. Department of Health and Human Services. (2004). *Bonehealth and osteoporosis: A report of the Surgeon General*. U. S. Department of Health and Human Services: Office of the Surgeon General.

21) During Pregnancy/Lactation:

- a. For those 18 years old and younger: 1300 mg/day.
- b. For those 19-30 years old: 1000 mg/day.
- c. For those 31-50 years old: 1000 mg/day.

22) Calcium

- a. Don't want to exceed 2000 -2500 mg a day.
- b. If supplementation is needed, the body absorbs about 500-600 mg at a time.
- c. If on an acid suppressing medication, calcium citrate supplementation is a better choice.

23) Interferences to Calcium Absorption:

- a. Oxalate: Found in foods such as beet greens, spinach, and rhubarb.
- b. Phytate Sodium: Found in legumes, 100% wheat bran.
- c. Excess protein intake.
- d. Excess caffeine intake.
- e. Excess phosphorus intake.
- f. Excess sodium intake.

24) Vitamin D

- a. Ways to obtain:
 - i) Food
 - ii) Sunlight
 - iii) Supplements/medication
- b. Some cereals and soymilk are fortified with vitamin D.
- c. Cheese, ice cream, butter, and most yogurts are not fortified with vitamin D.

25) Vitamin D Recommendations

- a. Adults under 50 years old: 400-800 IU/day.
- b. Adults aged 50 and older: 800-1000 IU/day.

26) Vitamin D toxicity:

- a. Among experts, the safe upper limit of vitamin D is debatable. Currently, 2000 IU/day is thought to be safe.
- b. Other than by taking a prescription dose of vitamin D, it is felt to be difficult to get too much vitamin D if the previous recommendations are followed.
- c. Vitamin D levels can be measured with a 25-hydroxyvitamin D blood test.

27) Other Nutrients:

- a. Fluoride stimulates bone growth.
- b. Iron, Copper, vitamin C, vitamin K, Zinc, and Manganese seem to help in the formation of the bone matrix.
- c. Magnesium may help in building bone and with calcium processing.

Helpful Internet Sites

- National Institute of Health Osteoporosis and Related Bone Diseases-National Reference Center
 - www.niams.nih.gov/bone
- Best Bones Forever
 - <http://www.bestbonesforever.gov>
- National Osteoporosis Foundation
 - www.nof.org
- West Virginia Osteoporosis and Arthritis Program
 - <http://www.wvbonenjoint.org/>

References

- Kanis , J., Melton, L., Christiansen, C., Johnston, C., & Khaltsev, N. (1994). The diagnosis of osteoporosis. *Journal of Bone Mineral Research*, 9 (8), 1137-1141.
- National Osteoporosis Foundation. (2010). *Clinician's guide to prevention and treatment of osteoporosis*. Washington, D. C.: National Osteoporosis Foundation.
- Osteoporosis Society of Canada. (1996). Clinical practice guidelines for the diagnosis and management of osteoporosis. *Canadian Medical Association Journal*, 155, 1113-1133.
- U. S. Census Bureau. (2007). *2005-2007 American Community Survey*. Washington, D. C.: Author.
- U. S. Department of Health and Human Services. (2000). *Osteoporosis prevention, diagnosis, and therapy*. U.S. Department of Health and Human Services: National Institutes of Health. NIH Consensus Statement Online 2000 [on-line]. Available: <http://consensus.nih.gov/2000/2000Osteoporosis111html.htm>
- U. S. Department of Health and Human Services. (2000). NIH consensus statement: Osteoporosis prevention, diagnosis, and therapy. Bethesda, MD: Author.
- U. S. Department of Health and Human Services. (2004). *Bone health and osteoporosis: A report of the Surgeon General*. U. S. Department of Health and Human Services: Office of the Surgeon General.
- U. S. Department of Health and Human Services. (2006). *The guide to clinical preventative services: Recommendations of the U. S. Preventative Services Task Force*. (No. 06-0588). Washington, DC: Agency for Healthcare Research and Quality.
- West Virginia Department of Health and Human Resources. (2004). *The burden of osteoporosis in West Virginia*. Charleston, WV: West Virginia Osteoporosis Prevention Education Program.

West Virginia Department of Health and Human Resources. (2008). *West Virginia osteoporosis and arthritis program strategic plan 2008-2013*. Charleston, WV: West Virginia Osteoporosis and Arthritis Program.

West Virginia Department of Health and Human Resources. (1999). *1999 Behavioral risk factor survey report*. Charleston, WV: Health Statistics Center.

West Virginia Department of Health and Human Resources. (2007). *2004-2005 Behavioral risk factor survey report*. Charleston, WV: WV Health Statistics Center.