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BONE MINERAL DENSITY IN GAMES AND SPORTS

Mr. Shafi Mohammad, Ph. D Scholar
Dr. Brij Kishore Prasad, Assistant Professor
Dept. of Health Sciences, LNIPE
Gwalior (M.P.)

ABSTRACT
A bone is a rigid organ that constitutes part of the vertebrate skeleton. Bones protect the various organs of the body, produce red and white blood cells, store minerals, provide structure and support for the body, and enable mobility. Bone density, or bone mineral density (BMD), is the amount of bone mineral in bone tissue. Bone density measurement is used in clinical medicine as an indirect indicator of osteoporosis and fracture risk. DXA is currently the most widely used for the measuring of BMD, but quantitative ultrasound (QUS) has been described as a more cost-effective approach to measure bone density. The DXA test works by measuring a specific bone or bones, usually the spine, hip, and wrist. Results are generally scored by two measures, the T-score and the Z-score. Scores indicate the amount one's bone mineral density varies from the mean. Negative scores indicate lower bone density, and positive scores indicate higher. Osteopenia and Osteoporosis are Common problems related to bone mineral density. Many studied showed that Physical exercise is an important factor in the acceleration and maintenance of bone mineral density (BMD). High-impact sports have been linked to increased bone density in young athletes. Many other studies held in recent past has proved that Individuals over 30, can still improve bone health through exercise.
Keywords: DXA, Osteoporosis and Osteopenia.

INTRODUCTION
A bone is a rigid organ that constitutes part of the vertebrate skeleton. Bones protect the various organs of the body, produce red and white blood cells, store minerals, provide structure and support for the body, and enable mobility. Bones come in a variety of shapes and sizes and have a complex internal and external structure. They are lightweight yet strong and hard, and serve multiple functions. Bone tissue is made up of different types of bone cells. Osteoblast and osteocytes are involved in the formation and mineralization of bone; Osteoclast is involved in the restoration of bone tissue. Bone is not uniformly solid, but consists of a flexible matrix (about 30%) and bound minerals (about 70%) which are intricately woven and endlessly remodeled by a group of specialized bone cells. Their unique composition and design allows bones to be relatively hard and strong, while remaining lightweight. Bone matrix is 90 to 95% composed of elastic collagen fibers, also known as ossein, and the remainder is ground substance. The elasticity of collagen improves fracture resistance. The matrix is hardened by the binding of inorganic mineral salt calcium phosphate in a chemical arrangement known as calcium hydroxylapatite. It is the bone mineralization that gives bones rigidity. Bone density, or bone mineral density (BMD), is the amount of bone mineral in bone tissue. Bone density measurement is used in clinical medicine as an indirect indicator of osteoporosis and fracture risk. It is measured by a procedure called densitometry, often performed in the radiology or nuclear medicine departments of hospitals or clinics. There is a statistical association between poor bone density and higher probability of fracture. Fractures of the legs and pelvis due to falls are a significant public health problem, especially in elderly women, leading to much medical cost, inability to live independently and even risk of death.

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Effective methods for testing

There are many different types of BMD tests, all are non-invasive. Most tests differ according to which bones are measured to determine the BMD result.

These tests include:

- Dual-energy X-ray Absorptiometry (DXA or DEXA)
- Dual X-ray absorptiometry and Laser (DXL)
- Quantitative Computed Tomography (QCT)
- Quantitative Ultrasound (QUS)
- Single Photon Absorptiometry (SPA)
- Dual Photon Absorptiometry (SPA)
- Digital X-ray Radiogrammetry (DXR)
- Single energy X-ray Absorptiometry (SEXA)

DXA is currently the most widely used, but quantitative ultrasound (QUS) has been described as a more cost-effective approach to measure bone density. The DXA test works by measuring a specific bone or bones, usually the spine, hip, and wrist. The density of these bones is then compared with an average index based on age, sex, and size. The resulting comparison is used to determine risk for fractures and the stage of osteoporosis (if any) in an individual.

Average bone mineral density = BMC / W [g/cm^2]

BMC = bone mineral content = g/cm

W = width at the scanned line

Interpretation of test

Results are generally scored by two measures, the T-score and the Z-score. Scores indicate the amount one's bone mineral density varies from the mean. Negative scores indicate lower bone density, and positive scores indicate higher.

Examination and Assessment of obtained results

The T-score is the relevant measure when screening for osteoporosis. It is the bone mineral density (BMD) at the site when compared to the young normal reference mean. It is a comparison of a patient's BMD to that of a healthy 30-year-old. The US standard is to use data for a 30-year-old of the same sex and ethnicity, but the WHO recommends using data for a 30-year-old white female for everyone. Values for 30-year-olds are used in post-menopausal women and men over age 50 because they better predict risk of future fracture. The criteria of the World Health Organization are:

Normal is a T-score of −1.0 or higher

Osteopenia is defined as between −1.0 and −2.5

Osteoporosis is defined as −2.5 or lower, meaning a bone density that is two and a half standard deviations below the mean of a 30-year-old man/woman.

The Z-score is the comparison to the age-matched normal and is usually used in cases of severe osteoporosis. This is the number of standard deviations a patient's BMD differs from the average BMD of their age, sex, and ethnicity. This value is used in premenopausal women, men under the age of 50, and in children. It is most useful when the score is less than 2 standard deviations below this normal. In this setting, it is helpful to scrutinize for coexisting illnesses or treatments that may contribute to osteoporosis such as glucocorticoid therapy, hyperparathyroidism, or alcoholism.

COMMON PROBLEMS RELATED TO BONE MINERAL DENSITY

Osteopenia is a condition in which bones are weaker than normal but not so far gone that they break easily, which is the hallmark of osteoporosis. Bones are usually at their densest when we are about 30 year age. Osteopenia, if it happens at all, usually occurs after age 50. The exact age depends how strong our bones are when we are young. If they are hardy, we may never get osteopenia.

Osteoporosis is a disease of the skeletal system that is characterized by low bone mass and micro architectural deterioration of bone tissues leading to enhanced bone fragility and increased fracture risk. It is largely a silent disease producing no symptoms until it is manifested clinically in the form of overt fractures.

ROLE OF SPORTS IN MAINTAIN BONE DENSITY

Physical exercise is an important factor in the acceleration and maintenance of bone mineral density (BMD). High-impact sports have been linked to increased bone density in young athletes. Klesges et al., (1996) has also shown that training using loaded weight bearing exercises causes significant higher bone mineral density. Regular exercise, especially resistance and high impact activities, contributes to development of high peak bone mass and may reduce risk of falls and osteoporotic fracture in later life. Many other researches show that these sports are also beneficial for the bone health of older competitors. According to Vonda J. Wright, MD "people participating in higher-resistance or high-impact sports had a statistically significantly higher bone density than those participating in the less high-resistance sports categories". She further added that as per the studies done in 2001 on senior Olympians, it was found that osteopenia and osteoporosis were less prevalent in senior athletes than the general population. Many other studies held in recent past has proved that Individuals over 30, can still improve bone health through exercise. Cross-sectional studies on active athletes have indicated a positive effect of collegiate sports participation on BMD compared to non-athlete controls. Furthermore, athletes continue to improve BMD measures throughout their collegiate career indicating an adaptation to loading over the competitive seasons. As for geometric properties of bone, athlete groups have greater cortical area, thickness, and moment of inertia compared to controls. While there have been a number of studies examining the effects of current sport participation on BMD in many different sports, there is greater interest in this relationship between sports and bone measures after retirement from sport. The key message for young men, according to the researchers is: "The more you move the more bone you build." It's time to get off the couch and work on your game.

CONCLUSION

Due to the risk of osteoporosis and osteoporosis-related fractures as well as mortality rates among fracture patients, it is important to understand factors associated with bone gain and later bone loss in life. Therefore, one should be aware about the status of bone mineral density of body. It is essential to understand before the degeneration of bones starts that we should actively participate in physical activity program because researches have proved that physical exercises perform major role in increasing the bone mineral density.

REFERENCES

Bennell, K.L, Malcolm SA, Khan KM, et al. (1997) Bone Mass and Bone Turnover in Power Athletes, Endurance Athletes, and Controls: a 12-month Longitudinal study Bone. 20(5):477-484

Cawthon, P.M, Ewing SK, McCulloch CE, Ensrud KE, Cauley JA, Cummings SR, et al.(2009) Loss of Hip BMD in Older men: the Osteoporotic Fractures in Men (MrOS) Study. J Bone Miner Res 24:1728–35.

Daly, R.M, Bass SL.(2006) Lifetime sport and leisure activity participation is associated with greater Bone size, quality and Strength in Older Men. Osteoporos Int.; 17(8):1258-1267

Karlsson, M.K, Linden C, Karlsson C, Johnell O, Obrant K, Seeman E.(2000) Exercise during growth and Bone Mineral Density and fractures in old age. The Lancet; 355:469–70.

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Kannus, P., Haapasalo M, Sankelo M, Sievanen H, Pasanen M, Heinonen A, et al.(1995) Effect of starting age of physical activity on Bone Mass in the dominant arm of tennis and squash players. Ann Intern Med; 123: 27–31.
Kelley, G.A, Kelley KS, Tran ZV (2000) Exercise and Bone Mineral Density in Men: A Meta Analysis. J Appl Physiol.; 88(5):1730-1736
Leigey, D., Irrgang J, Francis K, Cohen P, Wright V. (2009) Participation in High impact sports predicts Bone Mineral Density in Senior Olympic Athletes. Sports Health; 1:508–13.
Modder, U.I, Hoey KA, Amin S, McCready LK, Achenbach SJ, Riggs BL, et al.(2011) Relation of age, gender, and Bone Mass to circulating sclerostin levels in Women and Men. J Bone Miner Res; 26:373–9.
Pettersson, U., Nordstrom P, Alfredson H, Henriksson-Larsen K, Lorentzon R. (2000) Effect of High impact activity on Bone Mass and size in adolescent females: a comparative study between two different types of sports. Calcif Tissue Int.; 67(3):207-214
Van, Langendonck L, Lefevre J, Claessens AL, et al. (2003) Influence of participation in High-impact sports during Adolescence and Adulthood on Bone Mineral Density in Middle-aged Men: a 27-year follow-up study. Am J Epidemiol; 158(6):525-533
https://en.wikipedia.org
*htt*ps://www.sciencedirect.com
*https://www.*ncbi.nlm.nih.gov