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Protocol for Systematic Review: Peak Bone Mass Pattern in Different Parts of the World

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Abstract

Peak bone mass, which can be defined as the amount of bone tissue present at the end of the skeletal maturation, and also it is an important determinant of osteoporotic fracture risk. The peak bone mass of a given part of the skeleton is directly dependent upon both its genetics and environmental factors. Therefore, the aim of the proposed research is a comprehensive systematic assessment of the pattern of peak bone mass in different countries across the globe. The present article explains the protocol for conducting such a research.

Keywords: Peak bone mass; Osteoporosis

Background

Osteoporosis is a disabling disease characterized by compromised bone strength, which predisposes a patient to increased risk of fracture. The condition is a major public health problem in the Western countries and is projected to have a similar impact in the Middle East [1,2]. It has been suggested that peak Bone Mineral Density (BMD), which can be defined as the amount of bony tissue present at the end of the skeletal maturation, is a major determinant of osteoporotic fractures later on in life [3-6]. The probable importance of achieved peak bone mass for late life bone strength was first suggested by the cross-sectional observation of Newton-John and Morgan that the dispersion of bone mass values was not widened by age [7].

It has been generally accepted that peak bone mass at any skeletal site is attained in both sexes during the mid-thirties. After remaining constant for some years, bone mass starts to decline gradually; this condition starts few years before menopause in women and between the ages of 30 and 50 in men [4,5].

At the beginning of the third decade there is a large variability in the normal values of areal BMD, particularly at sites susceptible to osteoporotic fractures such as lumbar spine and femoral neck. Although genotype is believed to be one of the most important determinants of this large variance, several other variables, more or less independent, are also supposed to modify the genetic potential for achievement of optimum peak bone mass [8-10].

With respect to nutrition, the quantitative importance of calcium intake in bone mass accumulation during growth, particularly at sites prone to osteoporotic fractures, remains to be clearly determined. Moreover, life style, physical activity and environmental factors are among other factors affecting peak bone mass [10,11].

Studies have revealed a considerable diversity in peak bone mass in different societies [12-15]. Accordingly, because of the importance of osteoporosis and its consequent disabilities and the fact that there is no review studying the pattern of peak bone mass in different countries across the globe, the present systematic review will be conducted. The present article explains the protocol for conducting such a research.

Objectives of the review

The main objective of the study was to assess the heterogeneity of peak bone mass pattern in different populations based on their age, gender, ethnicity, the type of the used DXA as well as the geographical characteristics of the place (altitude, latitude) where the study had been conducted.

Methods

Eligibility criteria

Inclusion criteria: All the cross-sectional studies, regardless of being prospective or retrospective, conducted on peak bone mass between 1990 and 2014 will be included in this review. The following criteria should also be met in these studies:

- Studying a population aged between 20 and 50 years.
- Using DXA as the imaging system to assess peak bone mass.
- Assessing peak bone mass in at least one of the following sites: lumbar spine, femur and radius.

Exclusion criteria: We exclude the studies that assess peak bone mass

- In a non-random or a special sample.
- Solely in post-menopausal women.
- In a single vertebrae.

Moreover, we exclude duplicated citations and those studies that have not mention the data collection date or location.

Search strategy

With no language restriction, academic researches as well as the gray literature will be checked in this systematic review. Search terms listed below would be used to perform the electronic search in different databases.

Electronic search strategy

The following bibliographic databases and other sources will be searched for:

- Bibliographic databases: Cochrane Library (Wiley), MEDLINE (Ovid), Pub Med, MEDLINE (Ovid) In-Process, EMBASE (Ovid), CINAHL (EBSCO), Scopus, Science Direct, Springer Link and Google Scholar.
- Persian databases such as Iranmedex, Irandoc, Scientific Information Systems (SID), Iranian National Library (INL).
- Citations of relevant studies.

Search terms for electronic databases

The combination of the mesh terms "Bone Density" and "Peak Bone Mass" will be used to search the abovementioned sources. The Persian keywords are equivalent to their English words.

Data management

The initial search will be sensitive aiming to ensure the inclusion of all the relevant articles. The title and abstract of the found articles would be assessed to exclude the unrelated ones; any controversy will be addressed through discussion.

Based on the abovementioned inclusion and exclusion criteria, the relevance of the full text of the remainder to the objectives of this review will be assessed. The citations and references of the included articles will, thereafter, be checked and added to the list in case they meet the eligibility criteria to maximize the sensitivity of our search. If there is any doubt of eligibility, the article will be discussed in the group.

A reference manager library will be used to keep a record of these articles. It should be added that the number of articles found in each step would be recorded separately.

Assessment of methodological quality

Thereafter the papers would be critically appraised by two separate reviewers. In case of any discrepancy, a third reviewer would be asked to fill out the checklist.

The studies will be appraised using a modified STROBE statement based on the following criteria [16].

Categorizing studies

Considering the descriptive data mentioned in each research, final results will be categorized and then outlined in a form. We have generated a simple code sheet to gather items, including the country in which the study was conducted and its geographical description, publication year, target population and their age, gender and ethnicity distribution, studied bone sites, and the imaging technique used for diagnosis as well as the protocol used for determining peak bone mass.

Statistical analysis

The analysis was conducted using Stata version 11.1. Assessment of mean peak bone mass and mean age at peak bone mass were the final outcome of the meta-analysis. Studies estimating age at PBM based on maximum point of quadratic equation and Cubic equation the standard errors as well as those reporting BMD and PBM based on age categories were used in the meta-analyses. So, just the first kinds of studies will include meta-analyses. The heterogeneity of mean PBM and age at PBM were evaluated using I2 and Q test Cochrane [17]. Variables such as sampling, kinds of densitometry instruments used in the study, age distribution and difference between population ethnicities were examined for source of heterogeneity.

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