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The Risk Factors and Prevention of Osteoporosis

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Abstract:

Osteoporosis is a very common or silent disorder and disease without any evidence of diseases until a fracture occurs. In the world, approximately 200 million people are affected by osteoporosis and 8.9 million fractures occur in people. Hip fractures are major health problem by means of both social cost and health condition of the elderly because these fractures are one of the main causes of impairment, morbidity, decrease quality of life and mortality in men and women. The main objective of this paper to analyze the risk factors related to the enormous impact of osteoporotic fractures and preventing of disease. Osteoporosis's increasing trend is accompanied by an underutilization of available preventive strategies and at high fracture risk, only small number of patients are recognized and successively referred to as therapy. In osteoporosis management and indication, it provides analytic evidence to assess the best practices for adoption of a correct healthcare strategy to significantly reduce osteoporosis burden. Main focus on the attention to the identification of high fracture risk among osteoporosis patients.

Keywords: *Osteoporosis, Fracture Prevention, Morbidity*

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Introduction

Osteoporosis is a silent disease and skeletal disorder characterized by low bone density and microarchitectural deterioration of bony tissue. It increases in fracture risk factor which is major health problem and fractures that occur following minimal trauma or, in some cases, with no trauma. With osteoporosis, vertebral, hip and wrist fractures are most commonly connected. This fracture contains annual cost in England and Wales is £1.7 billion in which 90% of the cost was occurred by hip fractures. In the United States, the total cost of osteoporosis is estimated to be over $14 billion per year. This bone pathology can be classified into two forms: primary and secondary forms. Primary osteoporosis is characterized by a progressive mineral bone that is lost as a function of people aging and it is influenced by changes of sex hormone. Instead, different pathologies as well as the use of specific medications that affect skeleton health which can induce secondary osteoporosis. The primary form of osteoporosis consists of postmenopausal or senile disease (type I or type II). Usually aged from 50 to 65 years, type I osteoporosis takes place in a subgroup of postmenopausal women due to the efficiency of estrogen and consequent trabecular bone resorption. Mainly involve the spine and wrist in this set of women fracture pattern. The postmenopausal bone loss itself which is no left any evidence and causes any symptoms and therefore, the progressive bone loss has been called “the silent epidemic” or “silent thief”. The characteristic fracture of Type II osteoporosis consists of fractures of hip, tibia, proximal humerus and pelvis bone.

This type of risk factors, mainly considered a disease of women, an increase in age-related fractures has been observed also in men. Probably, unknown the number of males with osteoporosis because of the infrequency of screening and controversies in bone mineral density (BMD) testing standards in men. In a lifetime, approximately 50% of female and 25% of male will have an osteoporotic fracture. Due to increased incidence of disease, mortality and fracture-related costs, increasing socio-economic impact of osteoporosis. The occurrence of osteoporotic fractures is growing in several years in worldwide area as a consequence of increased durability of the population. By 1990, a number of hip fracture has been increased by 1.7 million and in 2050, hip fractures will exceed 21 million. Main focused must be the identification of high fracture risk patients which is needed to be prevention methods and therapeutic approaches to contrast fracture widening across populations. These techniques can be used to evaluate the risk of fracture. It falls into two major categories: Assessment of clinical risk factors (CRFs) of Osteoporosis and physical measurement of skeletal mass. The assessment of osteoporosis is based on bone density evaluation and there are no satisfying clinical approaches, independent of BMD, for bone quality estimation.

Risk Factors for Osteoporotic Fracture

There are several risk factors which affect osteoporotic fractures, which is as follows:

Bone mineral density

It has been shown that lower the BMD and higher the fracture risk in which bone mass can be measured at a number of sites including hip, lumbar spine, forearm and other sites. In BMD, used most common technique is dual energy x-ray absorptiometry (DXA) that is applied on at hip and spine body parts.

Body weight

This type of studies is shown that there is a negative correlation between low body mass index and peak bone mass. In which low body mass index and weight loss are strongly related to increased fracture risk.

Cigarette smoking

It has the inverse relationship between cigarette smoking and BMD in which many factors are contribute including an earlier menopause, reduced body weight and increased metabolic breakdown of exogenous estrogen in women. There was no significant difference in bone density between smokers and non-smokers at age 50, bone density in women diminished by 2% more in smokers than in non-smokers for each 10-year increase in age, with a difference between the two of 6% at age 80 years in the meta-analysis. Epidemiological studies suggested that an independent effect of cigarette smoking on risk of hip fracture.

Alcohol consumption

The detrimental of bone was occurred by the consumption of large quantities of alcohol due to which adverse effects on protein and calcium metabolism, gonadal function, mobility and a toxic effect on osteoblasts. In case of moderate quantities of alcohol, appear to be protective against bone loss at the hip portion and against the risk of vertebral fracture.

Nutrition

In premenopausal women, shown a link between calcium intake and bone mass in the study of meta-analysis. In another case, the relationship between

calcium intake and fracture rate is not certain. The positive association occurred in middle age and elderly women that have been reported between 25-hydroxyvitamin D concentration and BMD and inverse relationship between has been observed between serum parathyroid hormone and BMD. In elder, adequate vitamin D levels may also improve muscle strength and reduce both risk and consequences of falling.

Physical inactivity

BMD was increased by physical loading and mechanical stress and that certain forms of exercise may retard bone loss. The relationship exists between physical inactivity in elderly and the risk of hip and vertebral fracture which is shown in the study of epidemiological. Due to increased risk of falling, this effect might be shown.

Sex hormone deficiency

In both sexes, primary hypogonadism is linked with low bone density. The peak of bone mass is reduced and the risk of osteoporosis is increased in women with secondary amenorrhea and by late menarche, peak bone mass is also reduced. Before the age of 45, premature menopause is a strong element of bone loss and increased risk of fracture among women.

Other causes

The other causes of osteoporosis are:

- Malignant disease—for example, myeloma, lymphoma.
- Drugs—for example, corticosteroids, heparin.
- Endocrine disorders—for example, hypogonadism, Cushing's syndrome, hyperparathyroidism.
- Miscellaneous disorders—for example, connective tissue diseases, chronic renal failure.

Genetic factors

The 505 of the variance in peak bone mass is genetically determined, these studies were occur in twin case. The hereditability is believed to be polygenic. In addition, genetic effects appear to be stronger in the lumbar spine than in the femoral neck or distal forearm.

Prevention

Osteoporosis was previously considered a normal part of aging, but it is now understood to be preventable and treatable. In general population, many interventions reduce fracture risk and can be used for primary and secondary prevention. These strategies include adequate combined calcium and vitamin D intake (calcium alone has not been shown to reduce fractures), weight-bearing exercise, antiresorptive therapy, moderate alcohol intake, tobacco avoidance and avoidance of trip or fall hazards.

Calcium and Vitamin D Supplementation

For bone formation, calcium and vitamin D intake provide sufficient levels and maintenance of the bone density which reduce hip fracture risk in osteopenic and osteoporotic patients and decreases the incidence of falls in at-risk older adults. For primary and secondary prevention, supplementation has been long considered important but concern about potential risks of supplementation and unclear balance of benefits and harms has led to a recent change in guidelines. The U.S. Preventive Services Task Force (USPSTF) recently suggested ''against daily supplementation with 400 IU or less of vitamin D_3 and 1,000 mg or less of calcium for the primary prevention of fractures in non-institutionalized postmenopausal women". In premenopausal women and men, calcium and vitamin D are harmful for any daily supplementation and are unable to make recommendations on higher doses of calcium and vitamin D that is citing a lack of evidence. In case of calcium intake above 1200 to 1500 mg/day, has limited benefit and increasing the possibility of risk of cardiovascular disease and nephrolithiasis.

Weight-bearing exercise

In multiple studies, demonstrated the health benefits of exercise including fracture and risk of falls. For osteoporosis prevention, weight-bearing and muscle-strengthening exercise are suggested because it improves posture, agility, balance, and strength to prevent falls. Exercise increase their risk fracture and falls for some patients and physicians suggested for type and degree of activity based on individual risk. Some researchers suggest that exercise could prevent bone loss and fractures in postmenopausal women and this exercise effect was fall on BMD that was observed.

Additional interventions

Bones health are harmful by intake of tobacco and excessive alcohol and amount of daily alcohol intake that is harmful are unclear. According to Institute for Clinical Systems Improvement (ICSI), greater than 2 unit per day for women and greater than 2 units per day for men is harmful but according to Fracture Risk Assessment Tool (FRAX), incorporates greater than 3 units per day as a risk factor. When intake of moderate amount of alcohol, appeared to be associated with slightly higher BMD and lower fracture risk in

postmenopausal women. The researcher is no suggest that no more than 1 unit of alcohol daily for women and no more than 2 units daily for men. It falls prevention that helps prevent osteoporosis-related morbidity. Interventions include removing trip or fall hazards, vision and hearing correction, evaluating suspected neurologic problems, avoiding medications that cause imbalance, and advising hip pad protectors for those with significant risk.

FRAX score and risk-assessment tools

By World Health Organization (WHO), FRAX is a computerized fracture-risk algorithm development that uses global models of population-based cohorts combined with clinical risk factors. These tools are most useful in patients with low hip BMD. To calculate major osteoporotic and hip fracture risk that is combined with femoral neck BMD within 10 years and these tools are used without a DXA. If treatment should be initiated, when values can be used to decide; Food and Drug Administration (FDA) – approved therapy can be initiated for patients with osteopenia and a 10-year risk of hip fracture of at least 3% or a risk of a major osteoporotic fracture 20% or higher.

By combining clinical risk factors and BMD, increasing sensitivity and maintains specificity. FRAX has disadvantages that include an inability to incorporate all known clinical risk factors which are important in considering treatment and it also not incorporate spine BMD.

Other osteoporosis risk-assessment tools include the Osteoporosis Self-Assessment Screening Tool, Male Osteoporosis Risk Estimation Score, Simple Calculated Osteoporosis Risk Estimation Score, Osteoporosis Risk-Assessment Instrument, Women's Health Initiative hip fracture risk calculator, Osteoporosis Index of Risk and Osteoporosis Society of Canada and Canadian Association of Radiologists Working Group tool. These tools are helpful when BMD testing is unavailable.

Review of Literature

Gronholz 2008, stated that osteopathic medicine is uniquely suited to diagnosis and clinical management of osteoporosis that have a comprehensive treatment strategies and holistic approach. Unidentified or ineffectively managed BMD loss that can lead to vertebral and non-vertebral fractures, both fractures are associated with substantial mortality and morbidity between patients. To prevent disability and fracture resulting from osteoporosis, at-risk individuals—including men—must be identified routinely. Then they must be prescribed treatment that not only preserves bone strength but reduces the biomechanical stress that may lead to fracture. For patients, osteopathic physicians should develop a multifactorial management program with osteoporosis that includes nutrition guidance, risk factor modification and dietary supplementation, OMT, physical exercise and pharmacological treatment.

Cosman et.al 2014, dictated that this paper focused on prevention, diagnosis, and treatment of osteoporosis in postmenopausal women and men age 50 and older that are using most common existing diagnostic and treatment methods. Many additional issues urgently need clinical, epidemiological and economic research.

Schürer et.al 2015, stated that in North East Germany, analyzed for the first time comprehensive data on bone health. This result finds out the result that indicates a high prevalence of osteoporosis in 65 year age or above and also finds out that modifiable risk factors for osteoporosis are common, particularly in young women and men and previous fractures are linked with an increased risk for future osteoporotic fractures.

Thulkar and Singh 2015, in menopausal women, osteoporosis is becoming a major health problem in India on which, still research is far behind in India. Predispose to osteoporosis are referred to as genetic conditions. In postmenopausal women of northwest India, Vitamin D receptor (VDR) gene polymorphism and risk of osteoporosis were found. From India, association of apolipoprotein E (APOE) genotypes with BMD and risk of osteoporosis have also been reported. This study was only focused on postmenopausal women in which no India study was include that will add more knowledge about genetic predisposition to osteoporosis. Estrogen receptor alpha (ESR1) gene polymorphisms were discussed in India that is a most important factor, it is an essential hormone for absorption of calcium and bone metabolism.

Alkhaldi and Porter 2016, stated that in post-menopausal women, assess the effectiveness of different types of exercise on BMD including non-weight bearing exercise, weight-bearing exercise when a combination of weight bearing and non-weight bearing as well as vibration. In post-menopausal women, good effects on BMD was appeared by the weight-bearing exercise with longer intervention time and may be calcium/vitamin D supplements but non-bearing weight exercise studies used additive medication and supplements such as HRT, vitamin D, calcium but result did not come in the favor of this study. When done more studies, then suggest that non-weight bearing exercise over a longer duration may have beneficial effects on BMD.

Hazrati 2017, dictated that this paper was focused on osteoporosis and a broad range of medical subspecialties and on basic and clinical science of osteoporosis which is mainly dominate the literature in respect to absolute citation numbers.

Kalkım and Daghan 2017, concluded that increase women's knowledge of osteoporosis, their health beliefs, their self-efficacy and frequency of osteoporosis preventing behavior (OPB). By nurses, showed effects of health belief model (HBM) based osteoporosis preventing education and conducted counseling program. This counseling and education program preventing osteoporosis that is based on theoretical approaches; the program should be evaluated on an individual basis with home visits, and program's effectiveness should be evaluated by long-term monitoring of efficacy and measurement of bone mineral density.

Conclusion

Osteoporosis plays an important role in developing diseases or disorder which increase the risk of fracture in the hip, vertebral and wrist bone. It is affected estimated 10 million people which increases the risk due to which peoples were dead. This risk was developed by the efficiency of calcium, vitamin D, body weight, alcohol, cigarette smoke etc. These fractures are preventable by the use of sufficient level of calcium, vitamin D, regular weight-bearing exercise, fall prevention and avoidance of excessive alcohol and tobacco. It is necessary to encourage the widespread use of cheap, quick, non-invasive screening techniques and to increase national awareness campaign promoting a healthy lifestyle.

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