



RESEARCH ARTICLE

PREVALENCE OF RISK FACTORS FOR OSTEOPOROSIS AMONG FEMALES AGED 35 YEARS AND ABOVE IN SAUDI ARABIA

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Manuscript Info

Manuscript History

Received: 31 October 2020

Final Accepted: 30 November 2020

Published: December 2020

Key words:-

Osteoporosis, Prevalence, Risk Factors, Vitamin D Deficiency

Abstract

Osteoporosis is a common public health challenge globally but the relative contribution of various risk factors for osteoporosis in Saudi Arabia is not well established. We conducted this study to determine the prevalence of risk factors for osteoporosis among females aged 35 years and above in Saudi Arabia. We performed a descriptive cross-sectional study with a sample size of 2070 and determined the prevalence of risk factors as percentages of the total sample size. We found that vitamin D deficiency is the major modifiable risk factor for osteoporosis in Saudi Arabia followed by cigarette smoking. Autoimmune and endocrine diseases were also not uncommon. Our results therefore suggest for the strengthening of measures to prevent vitamin D deficiency, reduce corticosteroid-related osteoporosis and curb cigarette smoking.

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Introduction:-

Osteoporosis is a disorder manifested by unusually low bone mass and a deformity in the microstructure of the bone making it weak and at a greater propensity to fracture than normal^[1]. Osteoporosis is not uncommon in Saudi Arabia. In one study, 34% of women, and 30.7% of men between 50 to 79 years of age had osteoporosis^[2]. Bone loss in osteoporosis is caused by osteoclastic bone resorption, reduced bone deposition or the two acting together. The cause for fragility of the bone is not only the reduction in bone mass but also the defect in the microstructure of the remaining trabecular bone. Skeletal fragility is therefore related to many other factors including the rate of bone

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hormone are also associated with hypogonadal osteoporosis or menopause^[3]. In these women, there is a well-

known nearly rapid bone loss due primarily to heightened osteoclastic bone resorption after the release of oestrogen restraint. There is also a gradual loss of osteoblastic bone deposition that is contributed by nutritional deficiencies, chronic illnesses, and impaired ambulation of old age. After menopause, bone depletion usually accelerates to about 3% per year which is ten times faster than the previous two decades. Genetic predisposition contributes greatly in postmenopausal osteoporosis but also other risk factors including Caucasian ethnicity, low body mass index, history of amenorrhoea, early onset of menopause, oophorectomy, early hysterectomy, physical inactivity, cigarette smoking, alcohol abuse, inadequate calcium consumption, vitamin D deficiency, and the number of pregnancies have been identified^[5,6]. In pre-menopausal women, low bone mass can be attributed to secondary causes. Oestrogen deficiency from any cause such as hypogonadotropic hypogonadism resulting from low body mass index, psychiatric disorders such as anorexia nervosa, hyperprolactinemia, and hypopituitarism or hypergonadotropic hypogonadism due to various aetiologies including chromosomal abnormalities such as Turner syndrome and fragile X syndrome, toxins such as chemotherapy and radiation, and autoimmune diseases are but few^[7]. Drugs such as glucocorticoids, anticonvulsants, antidepressants and depot medroxyprogesterone acetate are linked to osteoporosis of premenopausal^[7]. Bone depletion is common in overt hyperthyroidism that carries an increased risk for fracture^[8]. Subclinical hyperthyroidism also causes low bone mass, particularly in the cortical bone with heightened risk of fracture^[9]. Although the classic osteitis fibrosa cystica is rare today, the bone; particularly at more cortical sites, remains a target for primary hyperparathyroidism^[10]. Hyperparathyroidism secondary to chronic kidney disease results to osteoporosis that affects predominantly the hip^[11]. In inflammatory bowel disease (IBD), osteoporosis is found in 18 to 42 per cent of patients^[12,13]. The aetiology of fragile bones in IBD usually emanate from multiple factors including corticosteroid therapy, disease-related systemic inflammation, malabsorption and hypogonadism^[14,15]. Osteoporosis is commonest in patients with IBD who have been given little corticosteroid therapy and who have vitamin D deficiency^[16]. Celiac disease also presents an increased risk to osteoporosis^[17,18] and fractures^[19] that can occur even in patients without gastrointestinal symptoms. Osteoporosis in celiac disease is due mainly to secondary hyperparathyroidism resulting from vitamin D deficiency^[20]. Other autoimmune diseases such as rheumatoid arthritis and systemic lupus erythematosus also predisposes to osteoporosis. Although the extent of rheumatoid arthritis in Saudi Arabia is not well established, the problem is not uncommon^[21]. Thyroid gland disease, which predisposes to osteoporosis, is not uncommon in the Arab region and is predominantly contributed by factors that are potentially modifiable^[22]. Despite efforts to prevent cigarette smoking in public places, smoking remains a public health challenge in Saudi Arabia that heighten the risk for cancer and osteoporosis^[23]. Cancer including gastrointestinal cancers and resultant gastrointestinal surgeries also causes osteoporosis and fractures^[24]. Due to the paucity of data regarding the relative contribution of various risk factors for osteoporosis and the high prevalence of modifiable risk factors that predisposes directly or indirectly to osteoporosis, we conducted this study to determine the prevalence of risk factors for osteoporosis among females aged 35 years and above living in Saudi Arabia. Some studies^[25,26] have established modifiable risk factors for osteoporosis such as vitamin D deficiency but did not particularly address the problem in the population of females aged 35 years and above which is at most high risk for osteoporosis. In this study, we also identified the prevalence of diseases that are associated directly or indirectly with osteoporosis in Saudi Arabia.

Materials And Methods:-

Study design

A descriptive cross-sectional study was done to determine the prevalence of risk factors for osteoporosis among females aged 35 years and above residing in the Kingdom of Saudi Arabia. All females aged 35 years and above were included in this study. Only participants who refused to consent for the study or with communication barrier were excluded.

Sampling method

A non-probability convenient sampling technique was employed in this study. Participants were selected based on accessibility and proximity to the King Abdul-Aziz University and Hospital. A total of 2070 participants aged 35 years and above were enrolled. All participants were eligible and consented to participate in this study. All the collected data were complete with an overall response rate of 100%.

Data collection and analysis

Medical students from the King Abdul-Aziz University were trained and involved in data collection that took place from May 2019 to May 2020. Data were collected using a structured interview with a questionnaire. The questionnaire's first section consisted of socio-demographic characteristics including age, nationality and whether they were in-patients or found in out-patient settings at the instance of data collection. The second section of the questionnaire consisted of risk factors for osteoporosis. The questionnaire was developed in both English and Arabic

forms and enough time was given during the interview together with adequate explanation of medical terms in layman's language to minimize recall bias. Data analysis was thereafter performed using IBM SPSS software version 17.0 (Chicago: SPSS Inc.) and prevalence of each risk factor expressed as the percentage of the total sample population.

Ethical considerations

Administrative approval was sought from the unit of biomedical ethics research committee. Ethical approval was sought from the ethical committee of the faculty of medicine, King Abdulaziz University, Saudi Arabia. Participants were informed about the purpose of the study and that participation was fully voluntary. An informed consent was obtained from participants and participants had absolute autonomy to withdraw from the study at any moment during the course of the study. To ensure confidentiality, the identity of the participants was closed.

Results:-

Socio-demographic characteristics

Most of our subjects were between 35 to 40 years old and Saudi in nationality. Of all, 71.4% were interviewed from outpatient settings (Table 01).

Prevalence of risk factors for osteoporosis among the study participants

Vitamin D deficiency was the most common modifiable risk factor present in 60.4% of subjects followed by cigarette smoking present in 11.1% of subjects. Genetic factor was the second most prevalent risk factor for osteoporosis present in 28.2% of subjects and the most common among non-modifiable risk factors. Hormonal problems accounted for 19.3% of subjects while thyroid gland disease was present in 16% of subjects. Other endocrine causes were rare (Table 02). Autoimmune diseases were also rare with rheumatoid arthritis being the most common; present in 9.6% of subjects. Of all, 8.7% of subjects were on long-term systemic corticosteroids. Only 1.8% of subjects had cancer.

Discussion:-

The chief function of vitamin D is, first: to enhance the absorption and transport of calcium from the gut, second: to facilitate bone remodelling by acting together with parathyroid hormone. Cholecalciferol, a natural form of vitamin D, is obtained primarily from the epidermis by the effect of ultraviolet radiation and secondarily from dietary sources. Insufficient exposure to sunlight, dietary deficiencies, or impairment in endogenous synthesis process, can lead to deficiency of vitamin D. The deficiency of vitamin D, although controversial, is defined as serum levels of less than 20 ng/mL^[27]. In most places, vitamin D is obtained from exposure to sunlight. The deficiency of vitamin D causes secondary hyperparathyroidism and depletion of bone; resulting to osteoporosis, and osteomalacia in the long term^[28]. In our study, vitamin D deficiency was found in 60.4% of all participants. Our finding is consistent with studies that show the increasing prevalence of vitamin D deficiency worldwide^[29,30]. This highlights the need to address vitamin D deficiency as a public health problem in Saudi Arabia especially to populations at risk. Osteoporosis is a common cause of morbidity in IBD causing fractures for several reasons including the disease-related systemic inflammation, corticosteroid therapy, hypogonadism, and vitamin D and calcium deficiency with advanced age and low BMI further increasing the risk^[31]. In our study, 26.1% of participants had IBD. This further highlights the necessity of preventing vitamin D deficiency. Thyroid hormone stimulated both bone deposition and resorption, but more rapidly the latter by primarily stimulating osteoclasts or by stimulating osteoblasts which bring about bone resorption by osteoclasts^[32]. Hyperthyroidism is therefore linked to rapid bone resorption and osteoporosis. Both overt and subclinical hyperthyroidism present a considerable risk for fracture^[8,33]. In our study, 16% of participants had a thyroid disease which put them at risk for osteoporosis. Although the reduction of bone mass in hyperparathyroidism is more on the cortical than trabecular bones^[34], and usually small, vertebral fractures are not uncommon in patient with primary hyperparathyroidism^[35-36]. Celiac disease, although rare: present in only 1.7% of our subjects, causes hyperparathyroidism secondary to the deficiency of vitamin D leading to heightened propensity to fracture in patients with celiac disease^[19,20]. Secondary hyperparathyroidism also occurs in chronic kidney disease that was found, together with chronic liver disease, in 8.7% of our subjects. Our findings were comparable to results from a community-based pilot study that found 5.7% prevalence of chronic kidney disease in the young Saudi population^[37]. The long standing use of glucocorticoids in rheumatoid arthritis (RA) can cause several complications including an increased risk of osteoporosis and skeletal fractures. In patients using prednisolone, the complications depends on the dose of prednisolone and mainly occur at doses greater than or equal to 5 mg per day but even at doses lower than 2.5 mg per day, complications can be evident^[38-39]. Bone depletion in RA is greater

with less tolerance to weight bearing exercises and can be partially attenuated by increased mobility^[40]. In our study, 9.6% of subjects had RA and therefore an increased propensity of osteoporosis and fractures. This finding underscores the benefits of treating all patients of RA on chronic therapy at doses of prednisolone above 5mg per day with 1000mg per day and 400 to 800 IU per day vitamin D supplementation^[38]. Long-term use of systemic corticosteroids is among the major aetiologies of osteoporosis. One study revealed that only few patients on long-term systemic corticosteroids receive primary prevention therapies against iatrogenic osteoporosis induced by corticosteroids^[41]. In our study we found that 8.7% of subjects were in long-term use of systemic corticosteroids for various medical conditions. This finding too highlights the utility of using calcium and vitamin D as primary preventive measure against corticosteroid-induced osteoporosis and related fractures. Evidence demonstrates that tobacco smoking causes deregulation of bone turnover through the RANKL-RANK-OPG pathway, causing accelerated bone loss; making the bone susceptible to osteoporosis and fracture^[42]. Although many strong risk factors for osteoporosis such as family history of osteoporosis: that was present in 28.2% of our subjects, and menopause, are not modifiable, cigarette smoking: present in 11.1% of our subjects, is a potentially modifiable target for public health intervention in Saudi Arabia where recent findings; despite public health efforts to curb smoking, suggest increased tobacco smoking^[23,43]. Cancer is also one of the major risk factors for bone loss and fractures. This is due both to direct effects of malignant cells on the bone and to deleterious effects of chemotherapies on bone cells^[44]. Despite the fact that the prevalence of cancer in Saudi Arabia is low compared to other countries, as well as the overall global population, it has risen significantly over the last two decades^[45] calling for public health interventions to prevent obesity and improve diet and exercise^[46,47]. Although the prevalence of SLE in Saudi Arabia is not accurately known, we found SLE in only 1% of our subjects. Some studies have found a higher incidence of SLE among Arab-Americans compared to non-Arab Caucasians and African Americans but little was known about the epidemiology of SLE among the Arab population worldwide or in the Middle East^[48]. Nonetheless, SLE presents a high risk to osteoporotic fracture without prior symptoms^[49].

Study Limitations

The major limitation of this study was the possibility of under-reporting or false reporting because this study was self-reporting in nature. Secondly, since this study was conducted at King Abdul-Aziz University and Hospital settings, the findings may not be representative of the whole population of Saudi Arabia. Finally, the information provided could not be verified.

Conclusion:-

According to our study, the deficiency of vitamin D is the major modifiable risk factor for osteoporosis in Saudi Arabia followed by genetic predisposition as the most common non-modifiable risk factor. The prevalence of inflammatory bowel disease was higher than endocrine causes of osteoporosis with hormonal problems found in 19% of subjects. Thyroid disease was present in 16% of subjects. Cigarette smoking was the second commonest risk factor that can be modified through public health interventions. Although autoimmune diseases were rare, rheumatoid arthritis was the most common. Taken together, our findings call for primary prevention of the deficiency of vitamin D and corticosteroid-related bone depletion in people with autoimmune diseases and long-term corticosteroid use. We also highlight the need for lifestyle changes to prevent cancer-related osteoporosis and fractures.

Acknowledgement:-

We thank the data collectors: Fatimah Aiyd Alqahtan, Ather Faisal Ageeli, Rahaf Mohammad Alqahtani, and Yara Jawad Alhamayl.

Source Of Funding

This study was self-funded by the authors and did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict Of Interest

No any conflict of interest was reported in this study

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