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Original Research Article

Major risk factors responsible for osteoporosis and osteoarthritis in general population of Karachi, Pakistan

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Abstract

Background: Osteoporosis and osteoarthritis is the most common bone disorder, however, the cause of both OA and OP are unknown. It has thought that the inherent and environmental factors such as metabolic or endocrine issues, genetic variation, various types of injury and trauma are the most common causes to be involved in both the abnormalities.
Objectives: The purpose of this study is to determine the major risk factors responsible for osteoporosis and osteoarthritis in the general population of Karachi, Pakistan.
Method: A cross-sectional study was conducted among the general population of Karachi for the period of 13 months starting from March 2015 to April 2016. Total numbers of 123 respondents were selected and were divided into four groups based on age i.e. 18-25 years, 25-40 years, 40-50 years and over 50 years. The data that were collected including gender, alcohol intake, smoking status, dietary intake, post-menopausal state and hormonal replacement. Analysis of data was carried out using SPSS Version 20.0.
Results: Out of 123 individuals participated in this study calcium intake among the respondents were highest in the age group of 18-25 years (95%). The rate of smoking was much higher in the age group 25-40 years (33.33%). Alcohol intake was found to be greater in the age group 40-50 years (20%). Arthritis was most common in the age group of 40-50 years (13.33%) whereas, the ratio of other diseases that can cause bone fragility was (48.38%) among the 50 above respondents.
Conclusion: The risk of developing osteoporosis and osteoarthritis is more among the individuals belonging to age group 50 years or above due to more frequent symptoms of low calcium in diet and presence of medical conditions related to the development of osteoporosis and osteoarthritis.
Keywords: Osteoporosis, Osteoarthritis, Postmenopausal, Calcium, endocrine, trauma, smoking.

1. Introduction

Osteoporosis (OP) can be defined as abnormal loss of bone that can leads to fractures. This progressive bone disorder represents the destruction of bone tissues and decrease in the bone mass that can increase the brittleness of bones thereby potentiates the chances of fracture [1, 2]. Whereas, the word osteoarthritis is originated from Greek word whose meaning consist of three parts i.e. bone, joint and inflammation. It is progressive bone disorders that can be define as the progressively slow destruction of cartilage that can stimulates the formation of bony cysts at the base of the joints [3].

In many cases the cause of both OA and OP are unknown, however it has thought that the inherent and environmental factors such as metabolic or endocrine issues, genetic variation, various types of injury and trauma are the most common causes to be involve in both the abnormalities [4]. Osteoporosis involves the regional circumstances in which there is an overwhelming destruction of lower limbs. However, the bones of lower limbs are highly exposed to the ground reaction forces, physical as well as mechanical stimulation occurs in the lower limbs due to gravity related weight bearing mechanism and by the contraction of the muscles during locomotion [5].

OP is very common in post-menopausal women but in addition it may also occur in men. The post-menopausal form of osteoporosis may be accompanied due

to reduce absorption of intestinal calcium and may be if there is a reduction in the biological active form of vitamin D3 in the body. However, in most of the cases it has also been observed that a post-menopausal osteoporosis may occur if there is a deficiency in the estrogen hormone and it can be treated well by using estrogen supplements [6]. Complications that are most commonly occurred in osteoporotic patients are hip, wrist, vertebrae and humorous fractures. Whereas, increasing age is also a higher risk of fracture which occur over 75years [7]. In USA, the yearly calculated cost of fractures in older women and men was approximately $13.8 billion in 1996 and would be much higher today [8].

Osteoarthritis is a bone disorders, which involves cartilages and synoviums. It is the most common of all rheumatologically disorders and characterized as the chronic diseases of bones. OA is considered as the main reason of hip and knee replacements in developed countries and particularly affects the aged population most commonly above the age of 65 years [9]. It was believed that aging is a major factor which contributes in the formation of osteoarthritis. But now it is thought to be the result of complex interplay of multiple factors including genetic predisposition, joint integrity, local inflammation, mechanical forces and cellular and biochemical processes [10]. This study was design to assess the major risk factors responsible for osteoporosis and osteoarthritis in general population of Karachi, Pakistan

2. Materials and methods

A cross sectional study was conducted among the general population of Karachi for the period of 13 months starting from March 2015 to April 2016.A total numbers of 123 respondents were selected and were divided into four groups based on age including both male and female 18-25 years, 25-40 years, 40-50 years and over 50 years. For data collection a questionnaire was constructed considering the factors that are associated with the development risk of osteoporosis and osteoarthritis. Different questions were asked about the symptoms and preventive measures related to osteoporosis and osteoarthritis. The data that were collected from different age groups individuals including: gender, alcohol intake, smoking status, dietary intake, post-menopausal state and hormonal replacement therapy as well as data related to the problems which hindered daily life performance.

2.1 Statistical analysis:

Analysis of data was carried out using SPSS Version 20.0. The data were presented in tabular form with the measure of frequency and percentage.

3. Results

A total number of 123 subjects were participated in this study out of which 40 were males and 83 were females. Calcium intake among the respondents were highest in the age group of 18-25 years (95%) (Table 1). However, the rate of smoking was much higher in the age group 25-40 years (33.33%) (Table 2). Alcohol intake was found to be greater in the age group 40-50 years (20%) (Table 3). Arthritis was most common in the age group of 40-50 years (13.33%) whereas, the ratio of other disease that can cause bone fragility was (48.38%) among the 50 above respondents (Table 4). Results regarding the family history of osteoporosis, exposure to sunlight and intensity of back pain among the four age groups are mentioned in (Table 5, 6 and 7).

Table 1: Calcium intake in different age groups

Age group (Years)	Frequency (n)	Calcium intake by Milk/Yogurt/any other dairy product (%)	Calcium intake by Calcium supplements (%)	Both (%)	None (%)
18-25	47	95	0	4.2	0
25-40	30	90	3.33	6.66	0
40-50	15	86.6	6.66	6.66	0
50 or above	31	64.5	22.58	9.67	3.22

Table 2: Ratio of smoking in different age groups

Age group (Years)	Frequency (n)	Yes (%)	No (%)
18-25	47	6.38	93.6
25-40	30	33.33	66.66
40-50	15	26.66	73.33
50 or above	31	38.7	61.29

Table 3: Alcohol intake in different age groups

Age group (Years)	Frequency (n)	Yes (%)	No (%)
18-25	47	2.12	97.87
25-40	30	6.66	93.33
40-50	15	20	80
50 or above	31	19.35	80.65

Table 4: Medical conditions related to osteoporosis in different age groups

Age group (Years)	Frequency (n)	Rheumatoid arthritis (%)	Eating disorder causing severe weight loss (%)	Hyperthyroidism (%)	Other conditions which may be linked to fragile bones (%)	Rheumatoid arthritis + diabetes (%)	None (%)
18-25	47	2.12	6.38	4.2	6.38	0	80.85
25-40	30	10	0	3.33	6.66	0	80
40-50	15	13.33	6.66	0	33.33	6.66	40
50 or above	31	3.22	6.45	3.22	48.38	3.22	35.48

Table 5: Family history of osteoporosis in different age groups

Age group (Years)	Frequency (n)	Yes (%)	No (%)
18-25	47	53.19	46.80
25-40	30	46.66	53.33
40-50	15	46.66	53.33
50 or above	31	35.48	64.51

Table 6: Exposure to sunlight on daily basis in different age groups

Age group (Years)	Frequency (n)	Yes (%)	No (%)
18-25	47	25.53	74.46
25-40	30	60	40
40-50	15	60	40
50 or above	31	41.9	58.06

Table 7: The intensity of back pain felt in different age groups

Age group (Years)	Frequency (n)	None (%)	Mild (%)	Moderate (%)	Severe (%)	Extreme (%)
18-25	47	51.06	25.53	14.89	6.38	2.12
25-40	30	33.33	36.66	20	3.33	6.66
40-50	15	20	13.33	33.33	33.33	0
50 or above	31	29.03	12.90	29.03	19.35	6.9

4. Discussion

Osteoporosis is a systemic disorder which involves the low bone mass and corrosion of micro tissue inside the bones which eventually increase the fragility of the bones and consequent risk factors [11, 12]. Earlier, osteoarthritis was known as the consequence of aging process, hence it was known as degenerative disease of bones. Conversely, the term osteoarthritis has been recognized as a complex relationship of multiple factors which involve the joint integrity, heredity, cellular and biochemical progressions [13].

Calcium is the most abundant mineral in body, found in food and also available as supplement. Bone itself undergoes continuous remodeling with constant resorption and deposition of calcium. The balance between bone resorption and deposition changes with age. Bone formation exceeds resorption in children and adolescents whereas in early and middle adulthood both processes are relatively equal. In aging adults, particularly among postmenopausal women, bone breakdown exceeds formation, results in bone loss that increases the risk of osteoporosis over time. Therefore, the calcium intake should be increased in diet as age increases [14].

Out of 123 respondents calcium intake in 18-25 years, were 95% taken through milk, yogurt and other dairy products while 4.2% in this age group used both dairy product and calcium supplement. This shows that majority of people in young age are taking calcium in dairy product forms. In 25-40 years, 90% taken through milk, yogurt and other dairy products while 6.66% via calcium supplements and dairy products and 3.33% were totally rely on calcium supplements. Above 50 years 64.5% taken calcium through dairy products, 22.58% via calcium supplements and 9.67% via both Calcium supplements and dairy products is 9.67% and 3.22% respondents were not taking any source of calcium. In old age, the body's need more calcium because bone breakdown exceeds over bone formation. But this study showed that with increasing age calcium intake were also decreases that will become a major risk of OP and OA.

Smoking has been listed for causing the low bone density, and thought to be linked with the hormonal changes and reducing the absorption of calcium through reduction of parathyroid hormones, whereby an increase in the estrogen level, adrenal androgen and cholesterol is associated with the smoking thus increasing the risks to develop the osteoporosis [15]. In our study, the ratio of

smoking among different age groups were 6.38% in the age group of 18-25 years, 33.33%in 25-40 years were smokers, 26.66% individuals were smokers in 40-50 years and 38.7% in above 50 years. Smoking was increasing with age and also become main risk factor of osteoporosis development.

Alcohol consumption can also be linked with weak bones. According to many research studies, chronic alcohol consumption caused reducing the bone length, and bone dry weight [16]. Alcohol consumption was found to be more in old age i.e.19.35% (above 50 years. Generally Alcoholics are found to have low level of vitamin D and also reduced level of protein to bind with vitamin D which protects it during the transport within the blood [17]. It means alcohol consumption would be an important risk factor of OP and OA.

Some medical conditions can also be linked to osteoporosis. One of them is eating disorders like anorexia nervosa. It is the disorder which is described as malnutrition and low level of estrogen. These factors can increase the risk associated with osteoporosis and collectively can worsen the bone health. Studies have shown the persistence of bone diseases and poor bone health even after they have recovered the poor nutrition and regained the normal eating habits [18]. In our study, higher rate of anorexia nervosa was found in the age group of 18-25 years, and in people aged 50 or above were 6.45%. However, above 50 would be more prone to OP and AS due to this increase rate of anorexia.

Bone is continuously being broken down and replaced by cells known as osteoclasts and osteoblasts. It takes 200 days for this each cycle of bone 'turnover' and excess thyroid hormone will hasten this rate of bone turnover. The bone building cells (osteoblasts) are not able to replace bone fast enough, if this process is happening too rapidly, the overall bone loss is increased. If the thyroid hormone levels stay too high for too long, there is an increased risk of developing low bone density and osteoporosis [19]. Diabetes, respiratory disease and rheumatoid arthritis may also leads to fragile bones and joints and can contribute to decrease the bone strength. Rheumatoid arthritis ratio vary among individuals fall in different age groups according to the recorded data of our study and was found to be higher i.e. 13.33% in 40-50 years.

Family history or genetic factors plays a very important role in the risk of developing osteoporosis. The person who has a family history of the disease is at a greater risk of developing it. Vitamin D is a secosteroid (a compound derived from steroid in which there has been a ring cleavage) produced in the skin from 7-dehydro-cholesterol under the influence of ultraviolet radiation [20].Vitamin D increases intestinal absorption of calcium and has a function in normal bone metabolism. Vitamin D is formed in the skin through the action of sunlight and occurs in foods such as liver, eggs, and milk [21]. In our study, it has been observed that most of the young population aged 18-25 were not exposed to sunlight daily i.e. 74.46%. Among other age groups: 25-40 years were 60%, in 40-50 years were 60%and in 50 or above were 41.9%. Possibility of OP will be more in people who have vitamin D deficient due to malabsorption of calcium in bones.

Poor diet and inactive life in young age leads to the early development of symptoms of OP or OA and this can be worse with increasing age [22]. The intensity of pain like back pain, pain in joints, pain after awakening, stiffness of body, difficulty in sitting may all indicate the development of OA or OP [23]. In our study, different types of pain were characterized as mild, moderate, severe, and extreme. However, in 40-50 years age group higher value of pain intensities were found i.e. mild (13.33%), moderate (33.33%), severe (33.33%). The presence of constant mild or moderate back pain with no treatment may lead to severe or extreme pain which will be the indication of more chance of having OP or OA.

5. Conclusion

The risk of developing osteoporosis and osteoarthritis was not the same when considering four different age groups because the risk factors of developing osteoporosis and osteoarthritis are also age dependent as bone breakdown exceeds over bone formation in old age. The risk of developing osteoporosis and osteoarthritis is more among the individuals belonging to age group of 50 years or above due to more frequent symptoms, low calcium in diet and presence of medical conditions related to the development of osteoporosis and osteoarthritis. The risk is even more in postmenopausal females due to low estrogen levels in the body.

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