

## ORIGINAL RESEARCH

# To determine the prevalence of osteoporosis in Smokers

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**ABSTRACT**

**Aim:** To determine the prevalence of osteoporosis in Smokers **Materials and Methods:** The current research was undertaken to evaluate the prevalence of osteoporosis among individuals who smoke. Included in the study were 200 individuals who had a smoking history of at least 10 cigarettes per day for a minimum of 5 years. In addition, a cohort of 200 individuals who were non-smokers served as normal controls. Comprehensive demographic and clinical information of all the patients was acquired. A comprehensive medical and personal history of all the individuals was also documented. A comprehensive clinical and oral examination was conducted on all the participants. The occurrence of osteoporosis was also recorded. **Results:** The average age of patients in the smoking group was  $47.85 \pm 2.85$  years, whereas in the control group it was  $48.96 \pm 2.88$  years. The prevalence of osteoporosis was 30 percent among smokers and 5 percent among non-smokers. Smokers have a much greater prevalence of osteoporosis compared to non-smokers. Among the patients in the smoking group, 50 percent of those with osteoporosis were between the ages of 45-55, while 25 percent were between the ages of 35-45. Among the non-smokers, 40 percent of the patients with osteoporosis were between the ages of 45-55, while 30 percent were between the ages of 35-45. Among the patients with osteoporosis, 71.67 percent of the smokers and 60 percent of the non-smokers were females. **Conclusion:** Based on the findings of the current investigation, the scientists have determined that smoking is a notable risk factor for osteoporosis.

**Keywords:** Osteoporosis, Smokers, BMD.

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**INTRODUCTION**

Osteoporosis is a condition characterised by the presence of porous bones. Osteoporosis is a pathological state caused by the depletion of bone tissue. Osteoporosis is a condition that causes bone weakening and increases the likelihood of fractures[1]. Osteoporosis is often seen as a condition that mostly affects women, however, it is worth noting that males account for up to 30% of hip fractures and 20% of vertebral fractures. The dimensions of bones remain constant, however their structural integrity and density are diminished. Osteoporosis primarily affects the vertebrae, hips, and wrists, potentially leading to physical disability or mortality. Osteoporosis is a prevalent bone metabolic disorder that ranks as the fourth leading cause of mortality in humans, behind cancer, cardiovascular disease, and stroke. Its prevalence tends to rise with advancing age. Osteoporosis is defined by reduced bone density and deterioration of bone structure, resulting in heightened bone fragility and

vulnerability to fractures[2,3]. Osteoporosis is a significant health issue in all countries due to its correlation with fractures. The T-score and Z-score indices are used to assess the density of bones. Osteoporosis, as defined by the World Health Organisation, is characterised by a bone mineral density that is 2.5 standard deviations or more below the average maximum BMD[4,5]. The T-score measures deviations in an individual's bone density standard deviation compared to the highest bone mineral density seen in healthy and young individuals. On the other hand, the Z-score reveals deviations in an individual's bone density standard deviation compared to persons of the same age, sex, and race. Osteoporosis is defined by a T-score below -2.5, whereas osteopenia refers to a T-score between -1 and -2.5. Factors such as age, sex, race, heredity, inadequate calcium intake, and activity level influence bone mass[6]. Smoking is one of the contributing causes to the illness. Smoking has a significant role in influencing bone mineral density (BMD)[7]. Both

men and females who smoke have been shown to have reduced bone mineral density (BMD) in the neck and spine. Additionally, smoking has been shown to increase the risk of hip fractures compared to those who do not smoke [8,9]. The risk of hip fracture among smokers increases across all age groups, but notably escalates from 17% at age 60 to 71% at age 80, and further climbs to 108% at age 90. Smoking has negative effects on bone strength by directly harming the bones through nicotine and other components of cigarette smoke. These harmful substances affect osteoblasts, which are bone-building cells, by binding to specific receptors. This leads to various consequences, such as reduced collagen synthesis, increased turnover of cells, decreased cell proliferation at high doses, and premature death of osteoblast cells. All of these effects contribute to the weakening of bones, making them more fragile. Smoking has an indirect impact on bone strength by reducing the absorption of calcium in the intestines, increasing metabolism, decreasing oestrogen synthesis, and causing hypercortisolism[12,13]. Individuals who are exposed to smoke have a higher likelihood of developing osteoporosis in the lumbar and femoral neck regions compared to those who do not smoke or are not exposed to smoke. The purpose of the research is to ascertain if smokers are more susceptible to osteoporosis compared to non-smokers. Therefore, the purpose of this research was to evaluate the prevalence of osteoporosis among individuals who smoke.

#### MATERIALS AND METHODS

The current research was undertaken to evaluate the prevalence of osteoporosis among individuals who smoke. Included in the study were 200 individuals

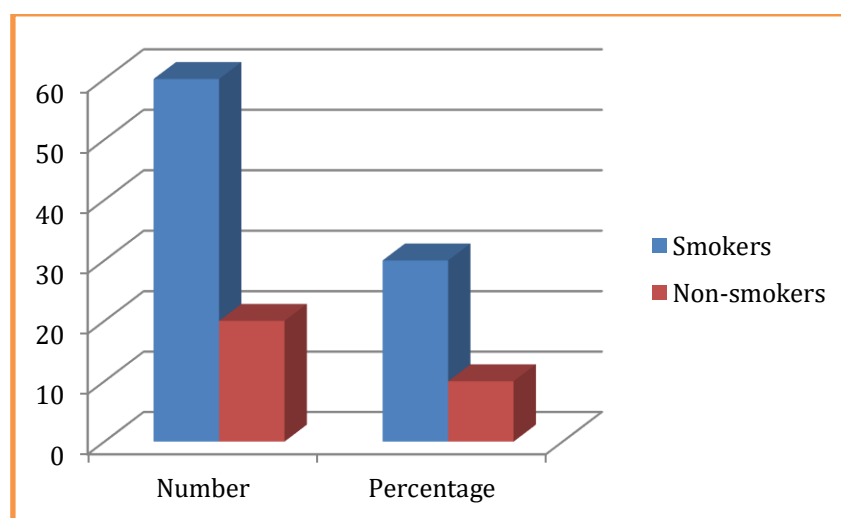
who had a smoking history of at least 10 cigarettes per day for a minimum of 5 years. In addition, a cohort of 200 individuals who were non-smokers served as normal controls. Comprehensive demographic and clinical information of all the patients was acquired. A comprehensive medical and personal history of all the individuals was also documented. A comprehensive clinical and oral examination was conducted on all the participants. The occurrence of osteoporosis was also recorded. The data were documented in a Microsoft Excel spreadsheet and analysed using the SPSS 25.0 programme. The degree of significance was evaluated using the chi-square test and the student t test.

#### RESULTS

The current study included the investigation of 200 individuals who were smokers and had a smoking habit of at least 10 cigarettes per day for a minimum of 5 years. In addition, a cohort of 200 individuals who do not smoke (referred to as normal controls) were also included in the study. The average age of patients in the smoking group was  $47.85 \pm 2.85$  years, whereas in the control group it was  $48.96 \pm 2.88$  years. The prevalence of osteoporosis was 30 percent among smokers and 5 percent among non-smokers. Smokers have a much greater prevalence of osteoporosis compared to non-smokers. Among the patients in the smoking group, 50 percent of those with osteoporosis were between the ages of 45-55, while 25 percent were between the ages of 35-45. Among the non-smokers, 40 percent of the patients with osteoporosis were between the ages of 45-55, while 30 percent were between the ages of 35-45. Among the patients with osteoporosis, 71.67 percent of the smokers and 60 percent of the non-smokers were females.

**Table 1: Incidence of osteoporosis**

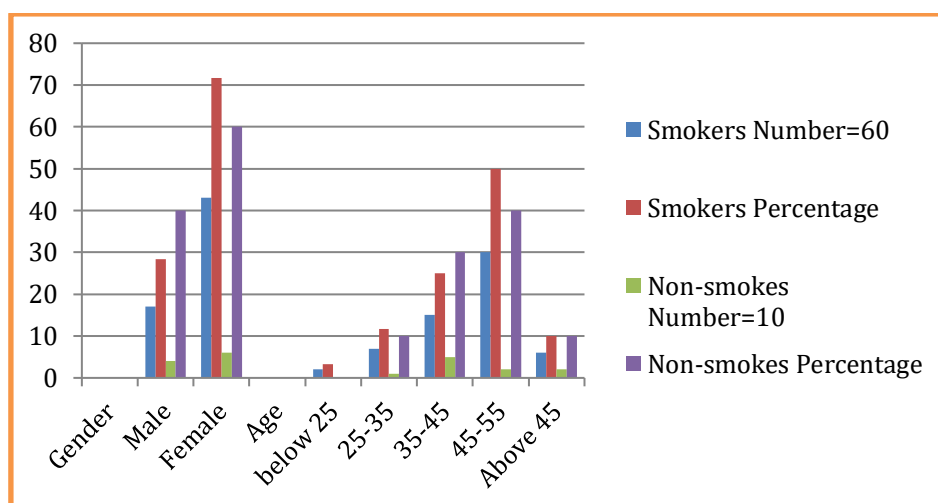
Osteoporosis	Number	Percentage	P value
Smokers	60	30	0.001
Non-smokers	20	10	



**Figure 1: Incidence of osteoporosis**

**Table 2: Gender and Age wise distribution of patients with presence of osteoporosis**

	Smokers		Non-smokes	
	Number=60	Percentage	Number=10	Percentage
<b>Gender</b>				
<b>Male</b>	17	28.33	4	40
<b>Female</b>	43	71.67	6	60
<b>Age</b>				
<b>below 25</b>	2	3.33	0	0
<b>25-35</b>	7	11.67	1	10
<b>35-45</b>	15	25	5	30
<b>45-55</b>	30	50	2	40
<b>Above 45</b>	6	10	2	10
<b>Mean Age</b>	47.85±2.85		48.96±2.88	

**Figure 2: Gender and Age wise distribution of patients with presence of osteoporosis**

## DISCUSSION

Osteoporosis is a well recognised condition that affects the whole skeletal system. It is characterised by reduced bone density and the degeneration of the bone's microarchitecture. This results in weakened bones that are prone to fractures. The World Health Organisation (WHO) recommends using Dual-energy X-ray Absorptiometry (DXA) as the gold standard diagnostic procedure for osteoporosis. Osteoporosis is characterised using this approach as having a bone mineral density (BMD) that is lower than 2.5 standard deviations (SDs) below the reference BMD of Caucasian women between the ages of 20 and 29. This concise explanation of osteoporosis facilitates the diagnosis and commencement of therapy for individuals with osteoporosis for doctors, orthopedicians, and endocrinologists. Nevertheless, DXA has certain constraints that hinder its use in the widespread screening of osteoporosis, a growing healthcare concern in emerging nations. Vitamin D insufficiency is a prevalent endocrine and medical issue worldwide. According to predictions, around one billion individuals worldwide suffer from Vitamin D deficiency[14-18]. The incidence of Vitamin D insufficiency in nations where food is fortified with Vitamin D ranges from 1.6% to 14.8%[15].

Among middle-aged and elderly individuals in other European nations, the prevalence of the mentioned condition was 59.6% in Boston, 24.1% in Tunisia, and 47.6% among young adults. Vitamin D insufficiency is more common in Asia, particularly India. Approximately 30%–50% of individuals in India, Lebanon, and Turkey[14], as well as 45.2% of women in China[19], had a deficiency in Vitamin D. In India, much research has been conducted; however, accurate data about the prevalence of osteoporosis is currently unavailable. Nevertheless, the number of Indians with osteoporosis is predicted to exceed 61 million, with females accounting for 80% of the cases [17,20,21]. Pande et al.[22] conducted a research which revealed a decrease in bone mineral density (BMD) that is dependent on age, seen in both women and men who are 50 years old or older. In 2010, Patni conducted a comprehensive research in Jaipur, India to build a normative database for bone mineral density (BMD) in the Indian population. The study used dual Energy X-ray absorptiometry. This research demonstrated that the average bone mineral density (BMD) in the Indian population is around two standard deviations lower than the BMD seen in Western populations[23]. The Indian Council of Medical Research suggests a much lower intake of calcium and Vitamin D for

Indians compared to the RDI of affluent countries[24]. Attaining adequate levels of Vitamin D from sun exposure is impractical for the majority of Indians, particularly those living in slums where overcrowding is a significant concern. Individuals from poor socioeconomic backgrounds sometimes face financial constraints when it comes to accessing and affording food items that are relatively high in Vitamin D. The majority of women living in slums adhere to a vegetarian diet due to financial constraints that prevent them from affording non-vegetarian food. Vitamin D pills are prohibitively expensive and impractical, making them inaccessible to many individuals. Enriching commonly eaten basic foods with Vitamin D is the only feasible approach to achieve Vitamin D adequacy in slums. The pathophysiological processes responsible for osteoporosis in individuals who smoke cigarettes have not been well investigated. Cigarette smoking can indirectly affect bone metabolism through various mechanisms, such as changes in the metabolism of calciotropic hormones, disruptions in the production, metabolism, and binding of estradiol, alterations in the metabolism of adrenal cortical hormones, and direct effects on the process of bone formation, including modifications in the RANK–RANKL–OPG system, collagen metabolism, and bone angiogenesis[25-27]. Therefore, the purpose of this research was to evaluate the prevalence of osteoporosis among individuals who smoke. The current study included the examination of 200 individuals who smoke, all of them had a smoking habit of at least 10 cigarettes per day for a minimum of 5 years. In addition, a cohort of 200 individuals who were non-smokers served as normal controls. The average age of patients in the smoking group was  $47.85 \pm 2.85$  years, whereas in the control group it was  $48.96 \pm 2.88$  years. The prevalence of osteoporosis was 30 percent among smokers and 5 percent among non-smokers. Daniell HW performed a comprehensive data search that revealed the presence of seventeen females diagnosed with severe idiopathic presenile osteoporosis. Out of the seventeen participants, one individual was identified as a nonsmoker, one person smoked less than 20 cigarettes per day, and fifteen individuals had a history of smoking 20 or more cigarettes daily for an extended period of time. Observations indicate that smoking may potentially cause early sex hormone deficit, as seen by the occurrence of menopause several years sooner in smokers compared to nonsmokers[28]. Existing epidemiological research and animal tests provide proof and logical reasons for the occurrence of osteoporosis caused by cadmium. Extensive research has been conducted to examine the biochemical process by which cadmium exerts its harmful effects on bone, resulting in the proposal of many models. A correlation between osteoporosis and renal impairment caused by cadmium exposure was documented in a Chinese population. Furthermore, the

deleterious impact of cadmium on bone was also seen in people without any indication of altered renal function, suggesting that cadmium has a direct influence on bone tissue. Animal investigations have shown that cadmium may disrupt bone metabolism via both direct mechanisms, such as affecting bone formation and resorption, and indirect mechanisms, such as impairing calcium and vitamin D metabolism[27-30]. Ghadimi R et al investigated the impact of smoking on elderly male smokers. The researchers determined that there is a significant correlation between reduced bone density and bone fractures in older male smokers[31]. The current research found a significant increase in the occurrence of osteoporosis among smokers compared to non-smokers. The prevalence of osteoporosis was 30 percent among smokers and 5 percent among non-smokers. The prevalence of osteoporosis was much greater among smokers compared to non-smokers. Among the patients in the smoking group, 50 percent of those with osteoporosis were between the ages of 45-55, while 25 percent were between the ages of 35-45. Among non-smokers, 40 percent of patients with osteoporosis were between the ages of 45 -55, while 30 percent were between the ages of 35 -45. Among the patients with osteoporosis, 71.67 percent of the smokers and 60 percent of the non-smokers were females. Female smokers experience menopause up to 2 years sooner than non-smokers, indicating premenopausal ovarian dysfunction. However, this effect is not seen in secondhand smokers. Additionally, smokers have reduced levels of 25-OH vitamin D3 and impaired calcium absorption[32,33]. Prior research that categorised males based on smoking characteristics has shown a negative correlation between bone mass and both the duration of smoking and the number of pack years. In relation to the daily cigarette use, studies involving males have shown inconclusive results, with both positive and negative outcomes. Individuals who smoke 20 or more cigarettes per day often have a significant decrease in bone mineral density (BMD) compared to individuals who have never smoked[34].

## CONCLUSION

Based on the findings of the current investigation, the scientists have determined that smoking is a notable risk factor for osteoporosis.

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