



Association between osteoporosis and gender, age, hypothyroidism, sex hormones among the middle-aged and old-aged population - A survey-based analysis

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ABSTRACT



Osteoporosis is a bone disease that results in weakening of bones and breakage of bones in severe cases. It means porous bone. It is most commonly seen in elderly people of both the sexes. In the early stages of bone loss, there are no symptoms. But once the bone gets weakened symptoms such as back pain, stooped posture, loss of height over time and easy breakage of bones can be seen. Age, sex, family history, sex hormones, thyroid problems are the risk factors of osteoporosis. Dietary factors such as low calcium intake and eating disorders are also the risk factor in osteoporosis. Sedentary lifestyle, excessive alcohol consumption and tobacco use can increase the risk of osteoporosis: good nutrition and regular exercise help to keep our bones healthy throughout our life. A self-administered questionnaire containing about 15 questions were prepared and circulated through online survey Google forms link. About 100 middle-aged and old-aged male and female people responded to the survey. The responses were collected, tabulated and statistically analyzed using SPSS software. 54% of the total population was male. 53% of the participants have responded that they have back pain. 38% of people responded that their parents or siblings suffer from osteoporosis. Osteoporosis is more common among elderly people and in postmenopausal women. Also, not only women but men also suffer from osteoporosis. A proper healthy diet and weight-bearing exercises can prevent osteoporosis. Prevention from fractures is the primary goal in osteoporosis.

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INTRODUCTION

Osteoporosis is a disease in which weakening of bone occurs, and that leads to increase risk of a broken bone. It is a common reason among elderly people. Bones which commonly break are vertebrae in the spine, bones of the forearm and hip. No symptoms will be shown until an occurrence of a broken bone. Bones weaken and lead to breakage due to minor stress spontaneously. Breakage of bone leads to chronic pain, and it decreases the ability to carry out our normal activities. Osteoporosis is one of the major problems that are faced by women and old people of both the sexes. It is only a decrease in

bone mass, and that is associated with a high risk of fracture (Riggs and Melton, 1995). It has no symptoms, and the consequences are the high risk of fracture. These fractures are regarded as fragility fractures that normally occur in the wrist, hip, rib and vertebral column. Osteoporosis is defined as a bone density of 2.5 SD below that of a young adult.

Fractures are common symptoms in osteoporosis and results in disability. Chronic and acute pain in elderly people leads to osteoporosis and further to disability and mortality. Fractures are asymptomatic also. Multiple vertebral fractures often lead to the loss of height, stooped posture and chronic pain and results in the mobility reduction (Kim and Vaccaro, 2006). In females, bone loss increases more after menopause due to a decreased level of estrogen. It is estimated that over two hundred million people all over the world suffer from osteoporosis. The prevalence of osteoporosis is escalating among elderly people. The major complication is that it leads to an increase in fragility fractures and thus leads to mobility, mortality and decreased quality of life (Reginster and Burlet, 2006).

As age increases and particularly after menopause, the effect of osteoporosis is increased further (Rachner et al., 2011). Osteoporosis occurs in all populations and in all the ages. More attention has to be paid to the skeletal health of persons who are suffering from secondary osteoporosis. Increase in a decreased level of Bone Mass Density (BMD) leads to fracture, and it is important that patients with osteoporosis do not go to have a fracture, whereas fractures occur in the general population without osteoporosis.

Factors that influence the risk of osteoporosis are diet, physical activity, medication and diseases. One of the most important clinical risk factors is a positive family history, and it shows that genetics play a role in the prevalence of osteoporosis (Sigurdsson, 2008). Osteoporosis occurs in aging. In men at about an age of 55 years, increase in fracture rate occurs. Individual fracture risk is inversely associated with bone density, and that is determined by density which is achieved at maturity leading to subsequent bone loss. Not all forms of osteoporosis are due to negative calcium balance. In age-related osteoporosis among men, depression of bone formation is a critical factor. Other than this osteoporosis is highly associated with mal-absorption of calcium or high calcium excretion, and negative calcium balance contributes least to it.

Osteoporosis is often considered as a disease of women. In the earliest reports, it is apparent that age-related increase in fractures is seen in women is

evident in men as well. Osteoporosis in men is now an important public health issue (Siris, 2001; Ralston and Uitterlinden, 2010). Women exhibit a dramatic increase in bone mass, which begins during their adolescence, and it completes when puberty ends. Postmenopausal women have a high risk of fractures compared to older men. This is because postmenopausal women have decreased estrogen rate that contributes to a higher rate of osteoporosis.

A 60-year-old woman has a 44% risk of fracture, and a 60-year-old man has a 25% risk of fracture (Herrmann, 2007). Similarly, it happens among men population, but the chronological onset of puberty is later in men than in women, and the peak bone mass achievement also occurs later. The adult bone mass development depends on changes in both density and size, sexual differences and mostly related to differences in size. Skeletal dimension is larger in men than those in women.

Androgen deficiency plays an important role in many cases of male osteoporosis. It promotes proliferation and differentiation of osteoblast, inhibits osteoclast recruitment and affects the osteoblast to osteoclast signalling (Anderson, 1998). In later life, loss of androgen is associated with increased bone resorption. The decreases in the levels of estrogen, testosterone and vitamin D with an increase in parathyroid hormone level are important in the pathogenesis of fragility of bones in elderly men. In many men with fractures, cause of bone loss is alcohol abuse, glucocorticoid metabolism and intestinal bowel disease.

Prevention of osteoporosis includes a proper diet during childhood, exercise and avoiding the medication that leads to an increase in the rate of bone loss. Fracture prevention is the primary goal treatment for patients with osteoporosis. Lifestyle changes such as quitting smoking and quit of alcohol also help in the prevention of osteoporosis. The diet must ensure optimal calcium intake (at least 1g daily), and the measurement of vitamin D level is recommended (Ludvigsson, 2014).

The aim of the present study is to evaluate the association between gender, age, hypothyroidism and sex hormones with osteoporosis among middle-aged and old-aged male and female population - A survey-based analysis.

MATERIALS AND METHODS

Study Setting

This study is about the association between age, gender, hypothyroidism and sex hormones with

osteoporosis among middle and old aged male and female population. This study is approved by the scientific review board, Saveetha Dental College, Chennai. To minimize bias, measures such as randomization including all variables, internal validity (pretested questionnaire) and external validity (homogenization and replication of experiment and cross verification with existing studies) are done. Simple random sampling is done. The sample size was 100. The questionnaire was circulated online. The responses are collected as data from surveys.

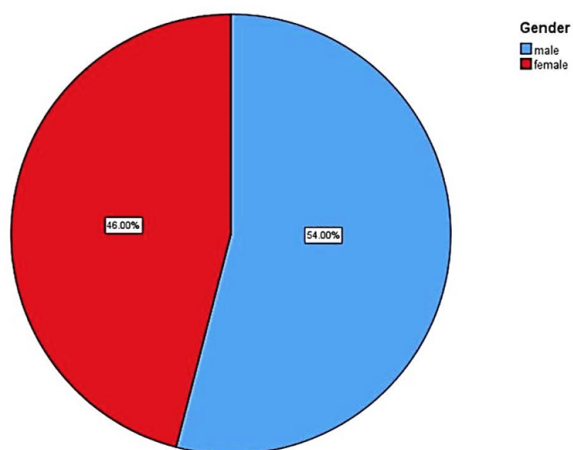


Figure 1: Represents the gender of the participants

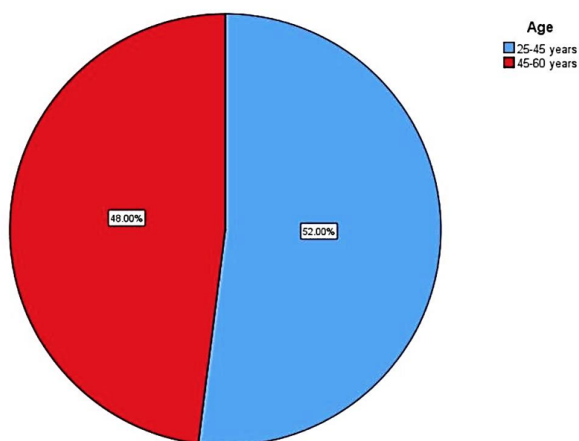


Figure 2: Represents the age of the participants

Data Analysis

Statistical software used in SPSS by IBM version 20.0. Type of analysis used is descriptive statistics. The data were statistically analyzed for any association using the chi-square test. Results are represented in the form of pie charts and bar charts. Independent variables are marital status, BMI and

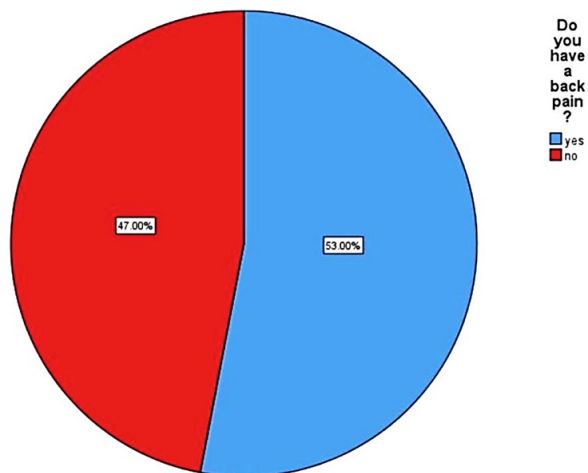


Figure 3: Represents responses on back pain

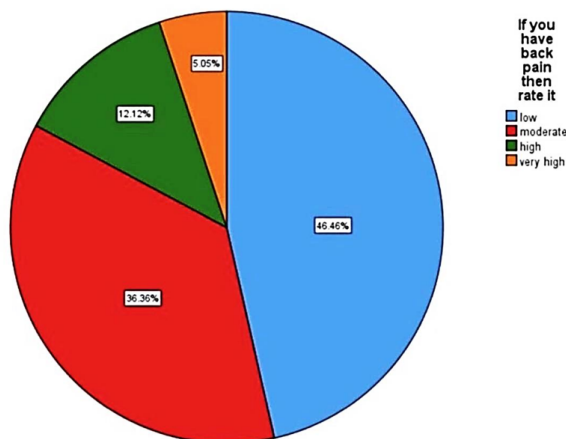


Figure 4: Represents the rate of pain experienced by the participants

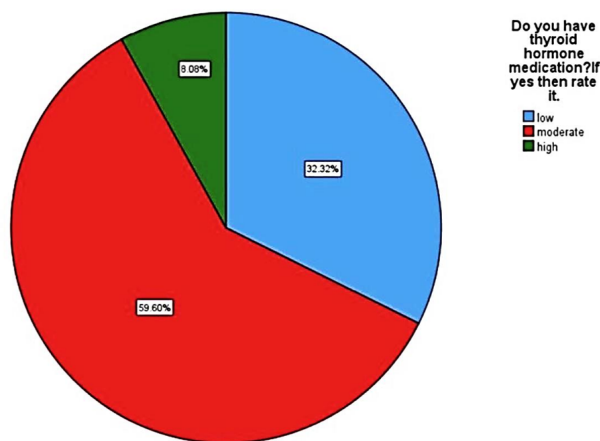


Figure 5: Represents the rate of thyroid hormone medication which was taken by the participants

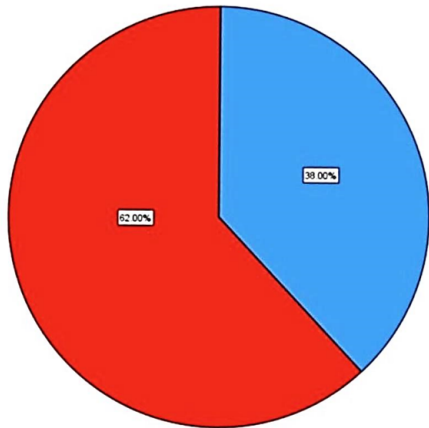


Figure 6: Represents whether their parents or siblings suffer from osteoporosis

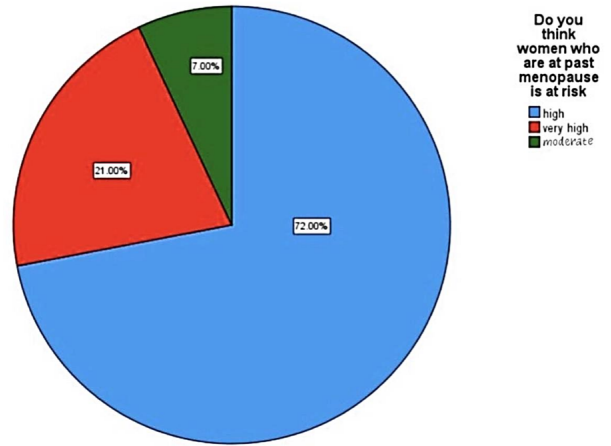


Figure 9: Represents the rate of risk among post-menopausal women

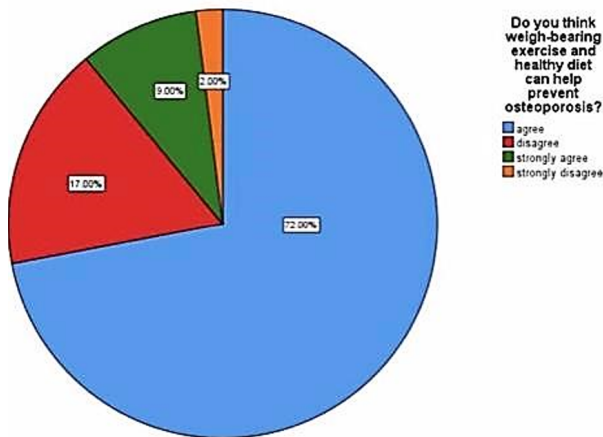


Figure 7: Represents the role of weight bearing exercises and healthy diet in the prevention of osteoporosis

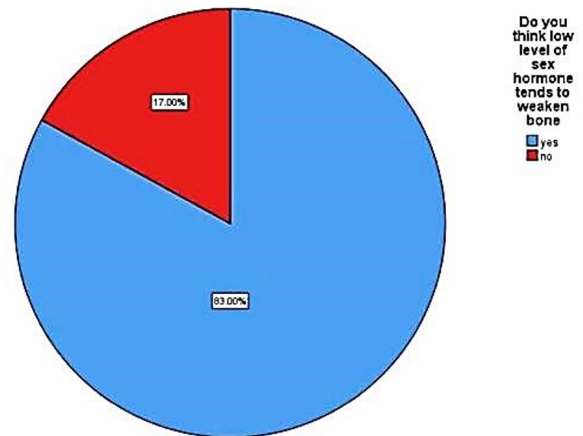


Figure 10: Represents the role of sex hormones in osteoporosis

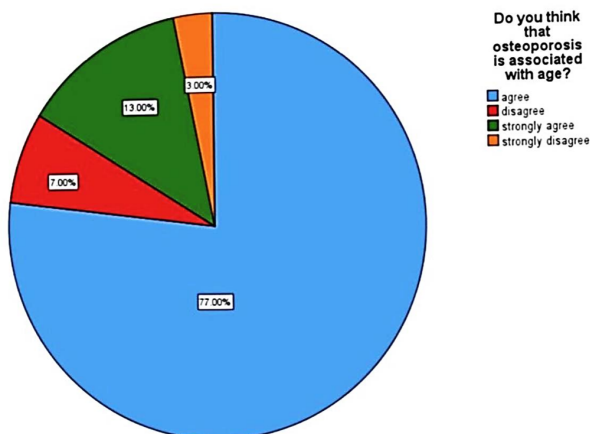


Figure 8: Represents the role of the age in osteoporosis

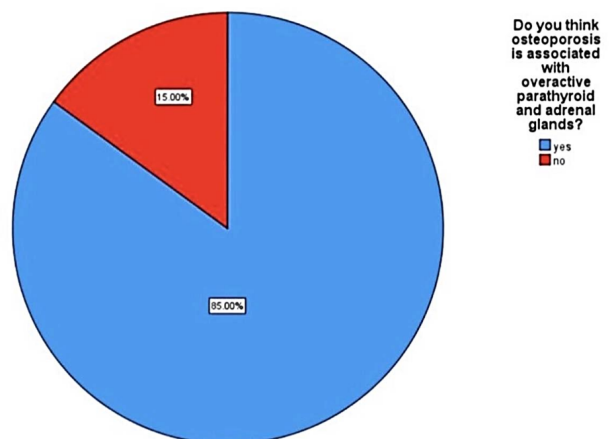


Figure 11: Represents the role of overactive parathyroid and adrenal glands in osteoporosis

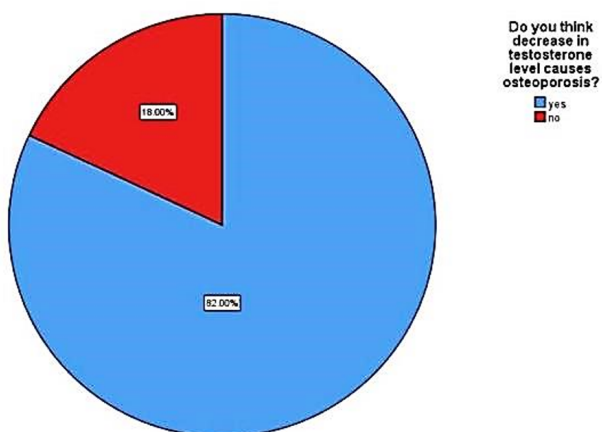


Figure 12: Represents the role of testosterone level in osteoporosis

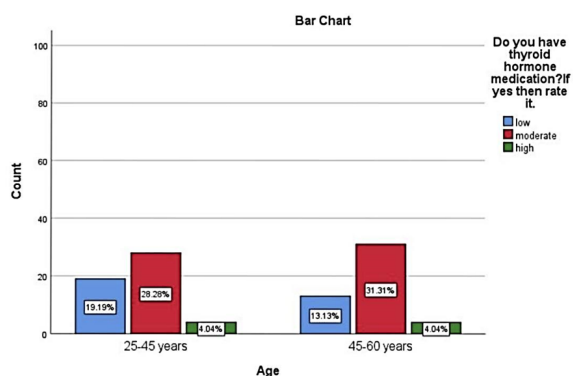


Figure 15: Bar chart represents the association between age and the rate of thyroid hormone medication

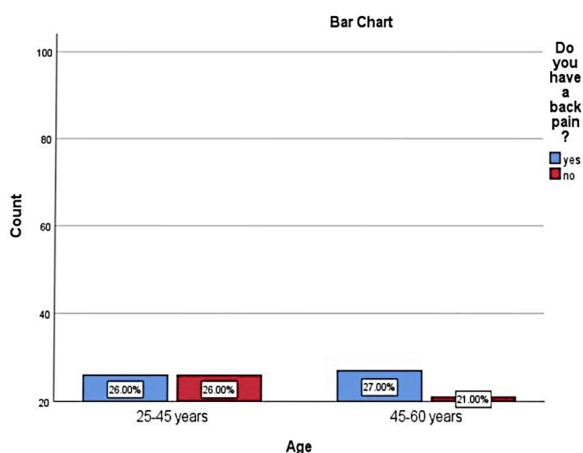


Figure 13: Bar chart represents the association between age and prevalence of back pain

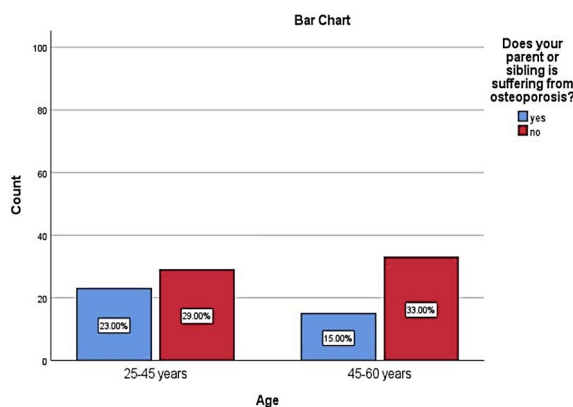


Figure 16: Bar chart represents the association between age and the prevalence of osteoporosis among the parents or siblings of the participants

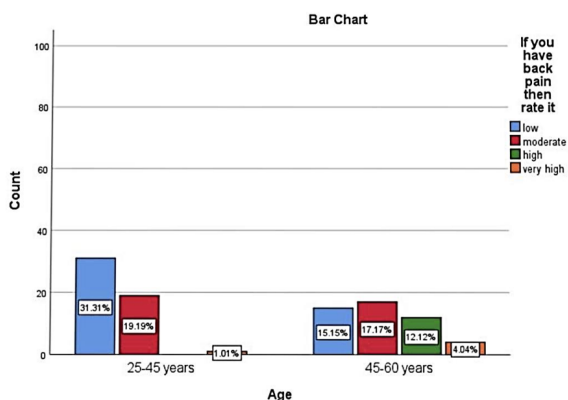


Figure 14: Bar chart represents the association between age and the rate of back pain experienced by the participants

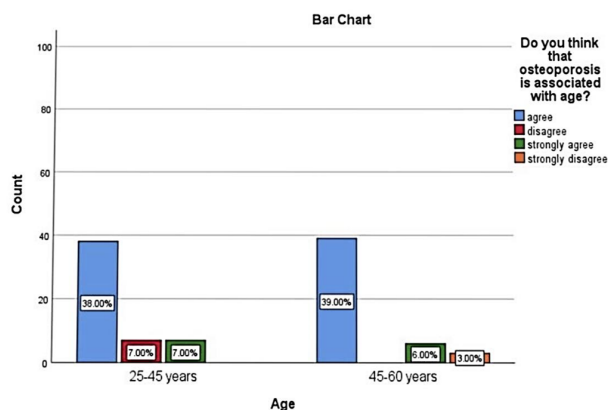


Figure 17: Bar chart represents the association between age of participants and association of osteoporosis with age

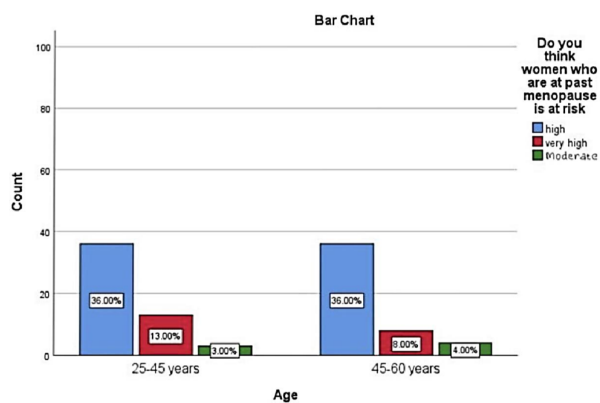


Figure 18: Bar chart represents the association between age of participants and rate of risk of women who are at past menopause

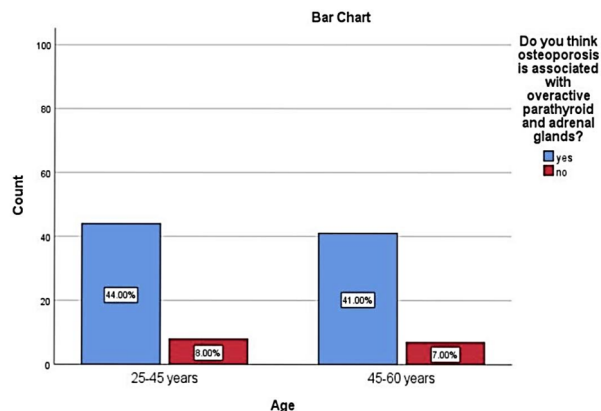


Figure 21: Bar chart represents the association between age of participants and role of overactive parathyroid and adrenal glands

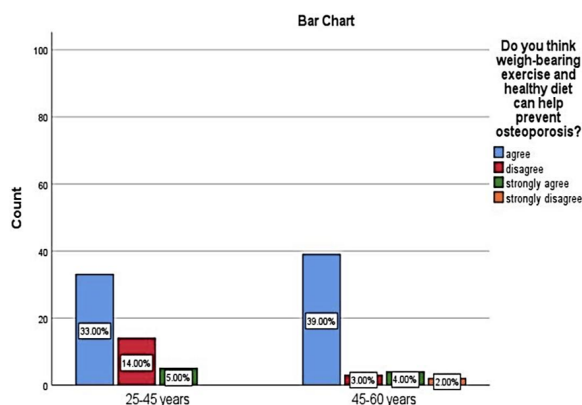


Figure 19: Bar chart represents the association between age of participants and role of weight bearing exercises in preventing osteoporosis

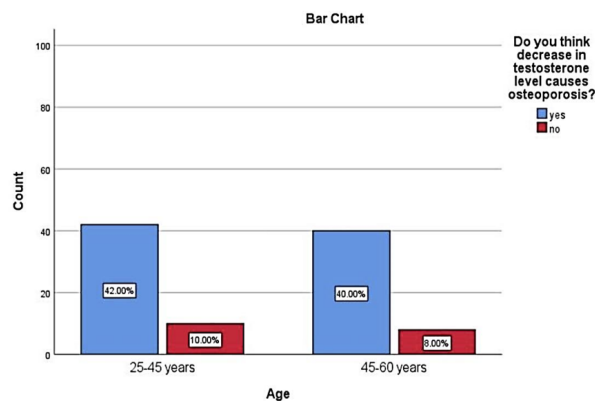


Figure 22: Bar chart represents the association between age of participants and level of test osterone

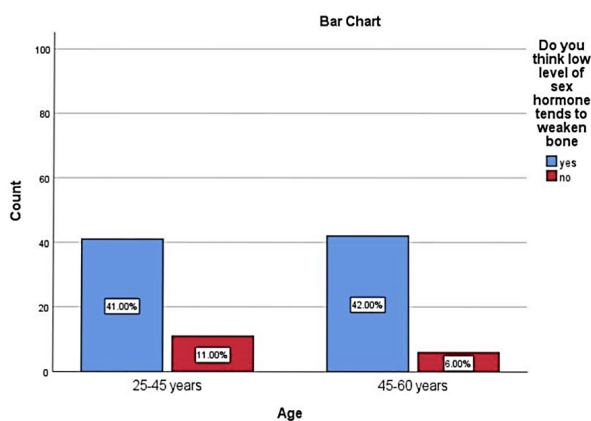


Figure 20: Bar chart represents the association between age of participants and role of sex hormones

dependent variables are genders, age, thyroid hormone level.

RESULTS AND DISCUSSION

In this study, a total of 100 responses were documented. 46% were female (Figure 1), 46% (red colour) represents females, 54% (blue colour) represents male and age ranged between 45-60 years of about 48% (Figure 2). 48% (red colour) belong to 45-60 years and 52% (blue colour) belong to 25-45 years. Participants were asked whether they have back pain, and if they have, they were asked to rate the pain. 53% have back pain (Figure 3), 53% (blue colour) have back pain and 47% (red colour) does not have back pain. and 12.12% pain is high (Figure 4).

46.46% (blue colour) is low, 36.36% (red colour) pain is moderate, 12.12%(green colour) pain is high

and 5.05% (orange colour) pain is very high. They were asked if they took any thyroid hormone medication and were asked to rate it if they take so. 8% have high thyroid hormone medication (Figure 5) (Johnson, 2020). 32.32% (blue) have low thyroid hormone medication, 59.60% (red) have moderate thyroid hormone medication and 8% (green) have high thyroid hormone medication.

Participants were asked about their family history, i.e., whether their parents or siblings suffer from osteoporosis. For that, 38% of them responded yes (Figure 6). 38% (blue colour) of them responded yes and 62% (red colour) responded no. Participants were asked whether weight-bearing exercise and a healthy diet can prevent osteoporosis. 9% strongly agreed to it (Figure 7) (Sekar, 2019). 7% (green colour) of them responded that women who are post menopause are at moderate risk, 72% (blue colour) responded as high risk and 21% (red colour) responded as very high risk. 72% (blue colour) agreed, 9% (green colour) strongly agreed, 17% (red colour) disagreed and 2% (orange colour) strongly disagreed.

Knowledge on osteoporosis was assessed by the question of whether age is associated with osteoporosis. For that 77%, which showed the majority of participants agreed to it (Figure 8) (Sepan et al., 2018). For that 77% (blue colour) of participants agreed, 13% (green colour) strongly agreed, 7% (red colour) and 3% (orange colour) disagreed and strongly disagreed. 21% of them responded that women who are post-menopause are at very high risk (Figure 9). 83% of them responded that a low level of sex hormones weakens bone (Figure 10). 83% (blue colour) of them responded that low level of sex hormones weakens bone and 17% (red colour) responded no it does not weaken bone. 85% of participants responded that overactive parathyroid and adrenal gland is associated with osteoporosis (Figure 11). 85% (blue) of participants responded that overactive parathyroid and adrenal gland is associated with osteoporosis, whereas 15% (red) responded that they are not associated with osteoporosis. 82% of the participants responded that a decrease in testosterone level causes osteoporosis (Figure 12) (Krishna and Babu, 2016). 82% (blue colour) responded that decrease in testosterone level causes osteoporosis, whereas 18% (red colour) responded that decrease in level of testosterone does not cause osteoporosis.

26% and 25% of participants of the age group 25-45 and 45-60 have responded that they have back pain. It was found that there was an association between age and prevalence of back pain and chi-

square test showing $p=0.53$ (>0.05) indicating statistically not significant (Figure 13) (Subashri and Thenmozhi, 2016). Chi square test showing $p=0.53$ ($p>0.05$) indicating statistically not significant. 31% of the participants of age 25-45 responded that pain is low. It was found that there was an association between age and the rate of back pain experienced by the participants, where chi-square test showing $p=0$ (<0.05) indicating statistically significant (Figure 14) (Nandhini, 2018). Chi square test showing $p=0$ ($p<0.05$) indicating statistically significant.

31.31% of the participants of age group 45-60 responded that the thyroid hormone medication rate is moderate. It was found that there was an association between age and the rate of thyroid hormone medication and chi-square test showing $p=0.55$ ($p>0.05$) indicating statistically not significant (Figure 15) (Keerthana and Thenmozhi, 2016). Chi square test showing $p=0.55$ ($p>0.05$) indicating statistically not significant. 33% of the participants of age group 45-60 responded that their parents or siblings do not suffer from osteoporosis. It was found that there is no association between age and the prevalence of osteoporosis among the parents or siblings of the participant, where chi-square test shows $p=0.18$ ($p>0.05$) indicating statistically not significant (Figure 16) (Pratha and Thenmozhi, 2016). Chi square test shows $p=0.18$ ($p>0.05$) indicating statistically not significant.

39% of the participants of age group 45-60 responded that osteoporosis is associated with age. It was found that there was an association between age of participants and association of osteoporosis with age, where Chi-square test shows $p=0.01$ ($p<0.05$) indicating statistically significant (Figure 17) (Thejeswar and Thenmozhi, 2015). Chi square test shows $p=0.01$ ($p<0.05$) indicating statistically significant. 36% of the participants of the age group 25-45 and 45-60 responded that women at the postmenopausal stage are at high risk. It was found that there was an association between age of participants and rate of risk of women who are at post-menopause and chi-square test shows $p=0.55$ ($p>0.05$) indicating statistically not significant (Figure 18) (Sriram et al., 2015). Chi square test shows $p=0.55$ ($p>0.05$) indicating statistically not significant.

39% of the participants of age group 45-60 responded that weight-bearing exercises prevent osteoporosis. It was found that there was an association between age of participants and role of weight-bearing exercises in preventing osteoporosis, where chi-square test shows $p=0.02$ (<0.05) indicating statistically significant (Fig-

ure 19) (Samuel and Thenmozhi, 2015). Chi square test shows $p=0.02$ ($p<0.05$) indicating statistically significant.

42% of the participants of age group 45-60 responded that a low level of sex hormone tends to weaken bone. It was found that there was an association between age of participants and role of sex hormones and chi-square test shows $p=0.25$ (>0.05) indicating statistically not significant (Figure 20) (Hafeez and Thenmozhi, 2016). Chi square test shows $p=0.73$ ($p>0.05$) indicating statistically not significant. Chi square test shows $p=0.25$ ($p>0.05$) indicating statistically not significant.

44% of the participants of the age group 25-45 responded that osteoporosis is associated with overactive parathyroid and adrenal glands. It was found that there was the association between age of participants and role of overactive parathyroid and adrenal glands and chi-square test shows $p=0.91$ (>0.05) indicating statistically not significant (Figure 21) (Choudhari and Thenmozhi, 2016). Chi square test shows $p=0.91$ ($p>0.05$) indicating statistically not significant.

42% of the participants of the age group 25-45 responded that a decrease in the level of testosterone causes osteoporosis. It was found that there was the association between age of participants and level of testosterone and chi-square test shows $p=0.73$ (>0.05) indicating statistically not significant (Figure 22) (Kannan and Thenmozhi, 2016).

In a previous study, 65.9% of the participants had pain. Pain is seen more in that study compared to this as this study has 47.9% of participants who responded that they have pain. (Monsanto, 2010) An earlier study reported that 6/73 participants responded that their parents or siblings suffer from osteoporosis. In this study, 38.4% of them have responded, and the result appears positive in this study (Pande, 2005). A previous study reported, 8% of people are aware that osteoporosis increases with age whereas in this study 90.9% of people are aware of it and this study holds more positive results (Monsanto, 2010). In a previous study, 3% of participants have responded that women at Post menopause are at high risk while in this study, 7.1% of them have responded positively, and they are aware of it. 4% of people are aware that low level of sex hormones weakens bones whereas, in this study, 83.6% of people are aware of it and so positive awareness is seen more in a previous study.

The present study serves as additional data to the existing literature and adds to the consensus. It can be utilized for similar and other confirmatory studies on the association between gender, age

and hypothyroidism and sex hormones with osteoporosis among middle-aged and old-aged male and female population (Menon and Thenmozhi, 2016). The limitation of this study is the small sample size, and the inclusion of more criteria is needed. The future scope is to get awareness on osteoporosis and early diagnosis, treatment and prevention.

CONCLUSION

Most of them are aware of its symptoms and its association to certain factors which leads to early diagnosis and treatment and then prevents osteoporosis. Guidelines for the diagnosis and treatment of osteoporosis are available in many countries, but implementation is poor with the availability of treatment with proven efficacy. Awareness on osteoporosis can be increased by programs which are essential for the general public. Early diagnosis helps from subsequent fractures and prevents osteoporosis. Bone mass assessment and fracture risk identification should be the optimal goals in evaluating patients for osteoporosis.

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Conflict of Interest

The authors declare that there was no conflict of interest for this study.

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