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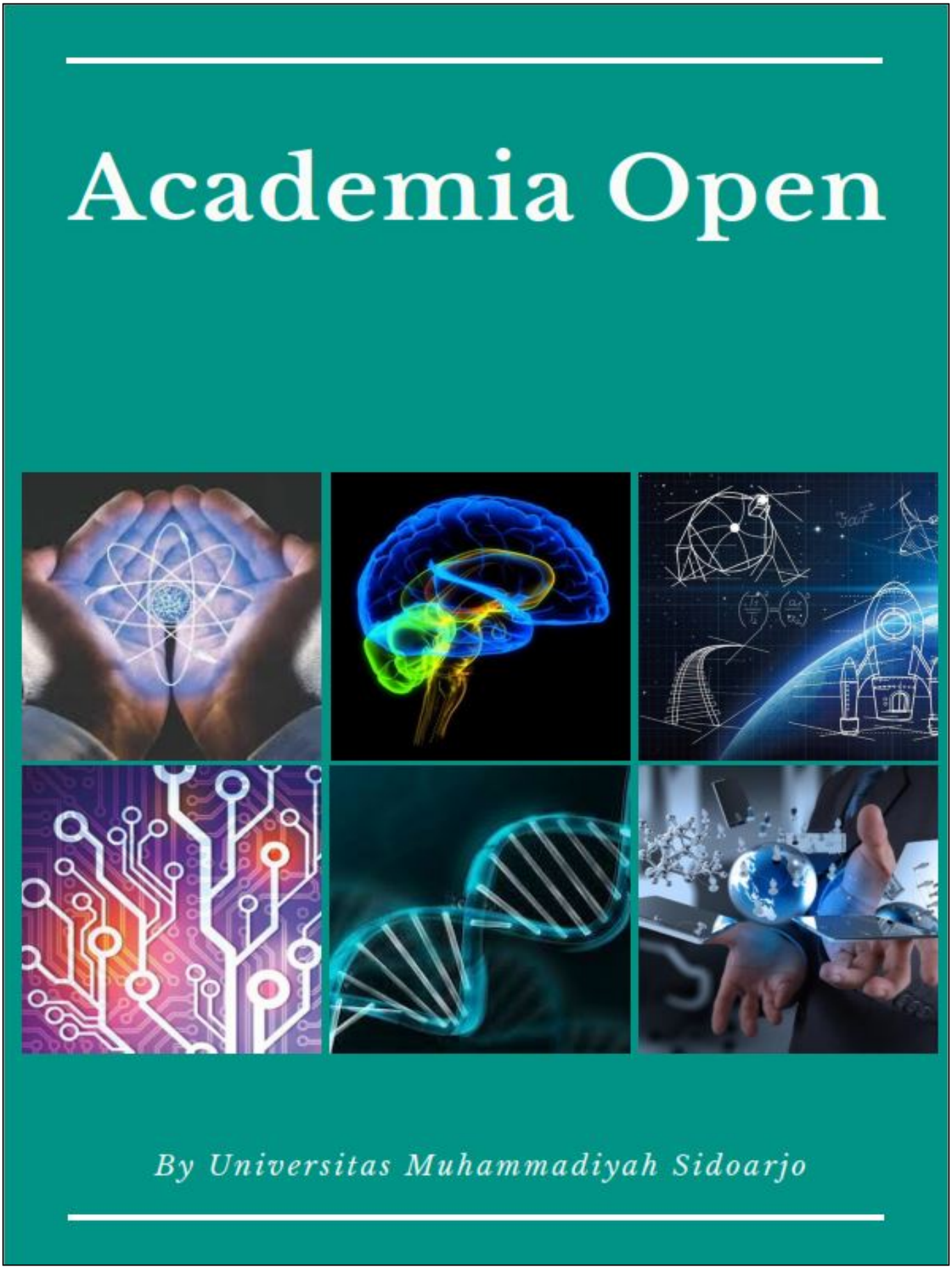

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Prevalence and Determinants of Osteoporosis Among Adults

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Abstract

General background: Osteoporosis is a major global health concern, particularly among older adults and women, due to its association with fragility fractures, disability, and mortality. **Specific background:** In Iraq, limited research has examined the prevalence and determinants of osteoporosis, despite rising cases linked to aging and lifestyle factors. **Knowledge gap:** Few population-based studies have systematically explored the interaction of biological, reproductive, and lifestyle factors in shaping osteoporosis risk in Diyala province. **Aim:** This study investigated the prevalence of osteoporosis and identified significant risk factors among adults in Diyala. **Results:** A cross-sectional analysis of 190 participants (130 females, 60 males; aged 21–80) revealed a significant association between osteoporosis and factors such as menopause, breastfeeding practices, pregnancy number, and oophorectomy ($p < 0.001$). Age and gender were also significantly associated with prevalence, with women disproportionately affected. **Novelty:** Unlike prior studies that mainly assessed bone density, this research integrates demographic, reproductive, and lifestyle variables to clarify their relative contributions in a Middle Eastern context. **Implications:** Findings highlight the urgent need for targeted prevention programs, including lifestyle modification and public health education, to mitigate osteoporosis burden in Iraq and similar settings.

Highlights:

- Osteoporosis prevalence is significantly higher in women, especially postmenopausal.
- Key risk factors include menopause, pregnancy history, breastfeeding, and oophorectomy.
- Findings emphasize the need for prevention through education and lifestyle modification.

Keywords: Osteoporosis, Osteopenia, Premenopausal.

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I ntroduction

Osteoporosis is a skeletal disease associated with a significant health and economic burden, which has become an increasing global health problem considering the aging population characterized by multi-morbidity. The morbidity and mortality imposed by osteoporotic fractures along with the negative impact on patients' quality of life are important clinical considerations [1]. Worldwide, osteoporosis causes more than 8.9 million fractures annually, resulting in an osteoporotic fracture every 3 s [2].

Osteoporosis is one of the chronic diseases since its development occurs over long period of time, slow and progressively, and cannot be transmitted from one person to another through contact [3]. Globally, osteoporosis presents a major public health concern since it associated with significant risk of fractures, morbidity, and mortality. The disease causes the bones to become more porous as well as fragile, leading to increased risk of fracture [4]. The fragility fractures frequently occur in the hip, vertebrae, and wrist of which the first two types of fractures increase with aging in both genders [5].

Osteoporosis is the most common bone disease in the human and characterized by low bone mass with deterioration of bone tissue, and disruption of bone micro architecture with a subsequent increase in bone fragility and predisposition to fracture [6 , 7]. One half of all postmenopausal women will experience an osteoporosis-related fracture during their lifetime [8].

Aetiology of osteoporosis is associated with genetic, environmental as well as lifestyle factors. According to Cosman et al. [9], increasing age, being female, postmenopausal status, hypogonadism or premature failure of ovaries, low body weight, parental hip fracture history, ethnicity (whites are more predisposed than blacks), previous clinical/ morphometric vertebral fracture, past fracture resulting from minimal trauma/previous osteoporotic fracture, rheumatoid arthritis, smoking, excessive alcohol use, (at least 3 drinks daily), low BMD, vitamin D deficiency, low calcium intake, hyperkyphosis, falling, immobilization, and prolonged use of some medications, particularly glucocorticoids, anticoagulants, and anticonvulsants to aromatase inhibitors and cancer chemotherapeutic agents plus gonadotropin-releasing hormone agonists elevate the risk of osteoporosis fractures. Of these, the non-controllable osteoporosis risk factors are age, sex, menopause, genetic predisposition and race, family history of fracture, hormone levels, and pregnancy number. Controllable risk factors include malnutrition, sedentary lifestyle, excessive alcohol use, and smoking as well as inadequate calcium plus vitamin D consumption, carbonated drinks, and inactive lifestyle [10], to name but a few. Further, reduction in estrogen level in women during their lifetime and low sunshine exposure are major contributing factors [11].The aim this study is to determine the factors affecting in the prevalence of osteoporosis in Diyala province.

Methods

A random sample of 190 people, 60 of whom were males and 130 of whom were females, aged between 21 and 80 years, was selected from Diyala Governorate. A questionnaire was used to collect data through personal interviews in clinics and health centers. The data was analyzed using the SPSS program by converting descriptive data into numerical data. A set of questions were asked and answers were given (yes or no), where the percentage was taken for each answer and they were compared.

[Table 1. about here]

Results and Discussion

A. Results

The outcome of present study demonstrates that the distribution of infected and uninfected individuals by gender, showing the numbers and percentages of both males and females in each category (Table 2). In the infected group, there are 16 males (18.60%) and 70 females (81.40%). While in the uninfected group, there are 44 males (42.31%) and 60 females (57.69%). The total in the infected group is 86 individuals (100%) and in the uninfected group is 104 individuals (100%).

[Table 2 . about here]

The result of the chi-square test is 12.24 with a p-value of 0.0021, which is less than the conventional significance level of 0.05, indicating that there is a statistically significant difference between the proportions of males and females in the infected and uninfected groups. The results show that the percentages of females in the infected group are significantly higher than those of males, while in the uninfected group the proportions are closer to gender balance. This large disparity in proportions shows that there is a statistically significant relationship between gender and incidence, which may indicate that there are factors influencing the incidence rate that differ between males and females.

Table 3 shows the distribution of infected and uninfected individuals across different age groups, classified by gender. The data includes the number (N) and percentage (%) of infected and uninfected males and females, and contains the results of the chi-square test to assess the statistical significance of observed differences between groups.

[Table 3 . about here]

Table 4 show the effect of the studied factors on patients with bone diseases, as the data is divided by gender and shows the

number and percentage of patients affected by each factor. Presence of vertebral diseases in the family history: The outcomes in the table 4) demonstrates that 11 male patients (21.15%) suffer from a family history of bone diseases, compared to 32 female patients (15.84%).

[Table 4 . about here]

Table 5: show the extent of the impact of the identified factors on osteoporosis based on the age at which these factors occurred, with an explanation of the numbers, percentages, and type of statistical test used.

[Table 5 . about here]

B. Discussion

Osteoporosis, a bone disorder that can be prevented, is considered one of the main causes of disability and death in elderly patients [12].

The outcome of present study demonstrates that the distribution of infected and uninfected individuals by gender, showing the numbers and percentages of both males and females in each category (Table 2). In the infected group, there are 16 males (18.60%) and 70 females (81.40%). While in the uninfected group, there are 44 males (42.31%) and 60 females (57.69%). The total in the infected group is 86 individuals (100%) and in the uninfected group is 104 individuals (100%). The result of the chi-square test is 12.24 with a p-value of 0.0021, which is less than the conventional significance level of 0.05, indicating that there is a statistically significant difference between the proportions of males and of female in the infected group are significantly higher than those of male, while in the uninfected group the proportions are closer to gender balance. This large disparity in proportions shows that there is a statistically significant relationship between gender and incidence, which may indicate that there are factors influencing the incidence rate that differ between males and females. This study reveals that osteoporosis is a disease that affects both genders, although its prevalence is higher among women than men. These findings are consistent with several previous studies [13, 14]. The reason for this is attributed to the fact that men tend to have denser and stronger bone mass compared to women [15].

Table 3 shows the distribution of infected and uninfected individuals across different (%) of infected and uninfected males and females, and contains the results of the chi-square test to assess the statistical significance of observed differences between groups.

In the age group 21-35 years, the data show that the incidence rate among females (31.43%) is higher than that of males (50%). In contrast, the incidence rate among uninfected males (47.73%) is lower than that of uninfected females (50%), indicating that females in this age group are more susceptible to infection than males, although the difference is not significant. In the age group 36-50 years, there is a significant gender disparity. The incidence rate among females (55.71%) is significantly higher than that of infected males (12.50%). In contrast, the incidence rate among uninfected males (50%) is higher than that of uninfected females (41.67%), highlighting the significant difference in incidence rates between the sex, with females being more affected.

In the age group 51-65 years, the number of infected individuals is very small. There are no infections among males, and the infection rate among females is low (7.14%). The uninfected numbers of both sex are relatively close, with slight differences in the proportions.

In the age group over 65 years, there is a clear difference in infection rates between the sex. The infection rate among males reaches 37.50%, while there are no infections among females. There are no uninfected cases between the sex in this age group, indicating a high prevalence of infection among males and its absence among females.

The results of the Chi-square test show a probability value of 18.84, with a p-value of 0.00029, indicating a statistically significant difference ($p < 0.05$). This means that the observed differences in infection rates between age groups and sex are statistically significant, indicating a significant effect of age and sex on infection rates. However, the p-value for the gender comparison within each age group is 2.078, with a p-value of 0.553, indicating that there is no statistically significant difference between the genders within each age group, although the overall data show significant differences. This may indicate that the gender difference is more pronounced when all age groups are considered together, while specific age groups do not show consistent differences in incidence rates between the genders. As shown in Figure, there are significant differences in incidence rates based on age and gender, with varied patterns across different age groups. The overall analysis highlights a significant effect of age and gender on incidence rates, with significant differences in some age groups. Further research may be necessary to understand the underlying factors contributing to these differences.

The results in Table 4 show the effect of the studied factors on patients with bone diseases, as the data is divided by gender and shows the number and percentage of patients affected by each factor. Presence of vertebral diseases in the family history: The outcomes in the table 4) demonstrates that 11 male patients (21.15%) suffer from a family history of bone diseases, compared to 32 female patients (15.84%). In contrast, 5 male patients (6.58%) suffer from patients with a non-family history, while the rate among females reaches 38 patients (10.61%). Presence of chronic diseases: Because the data among males is that 4 patients have chronic diseases (7.69%), while the rate among females is 13 patients (6.44%). As for people who do not suffer from chronic diseases, the rate is 12 male patients (15.79%) and 57 female patients (15.92%). Following a healthy diet: Monitoring male data indicates that 5 female patients (9.62%) follow a healthy diet, compared to 25 female patients (12.38%). As a result, the percentage of males who do not follow a healthy diet is 11 patients (14.47%),

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while the percentage of females is 45 patients (12.57%). Consumption of comprehensive beverages: The data of females indicated that 10 patients (19.23%) consume soft drinks, while the percentage of females is 33 patients (16.34%). Among those who do not consume soft drinks, the percentage is 6 male patients (7.89%) and 37 female patients (10.34%). Consumption of alerts: Males indicate that 6 patients (11.54%) consume alerts, while the percentage of females is 25 patients (12.38%). The percentage was 10 male patients (13.16%) and 45 female patients (12.57%). Immune system diseases: It is shown that one male patient (1.92%) suffers from these diseases, compared to 11 female patients (5.45%). In comparison, the percentage among males who do not suffer from these diseases is 15 patients (19.74%), while the percentage among males who do not suffer from these diseases reaches 59 patients (16.48%). Breast cancer: The data for males remains that 1 female patient (1.92%) suffers from cancer problems, compared to 5 female patients (2.48%). As for people who do not suffer from thyroid problems, the percentage is 15 male patients (19.74%) and 65 female patients (18.16%). Vitamin D deficiency: The table shows that in males, 14 female patients (26.92%) suffer from vitamin D deficiency, compared to 58 female patients (28.71%). As for those who do not suffer from vitamin D deficiency, the percentage is 2 male patients (2.63%) and 12 female patients (3.35%). Chi-square test results: The chi-square test indicates that the statistical value is 2.468, which means that all the factors included no statistically significant differences between males and females ($p > 0.05$). Therefore, there are no significant differences between the sex in the effect of these factors on bones.

The results in (Table 5) show the extent of the impact of the identified factors on osteoporosis based on the age at which these factors occurred, with an explanation of the numbers, percentages, and type of statistical test used.

1. **Menopause**

The results indicate that 11 patients (15.71%) had their menstrual cycle stop before the age of 45 years, while 16 patients (22.86%) had their menstrual cycle stop after the age of 45 years. There are 43 patients (61.43%) whose menstrual cycle stop was not determined. The Chi-square test shows a value of 25.4 with a statistical significance of less than 0.001, indicating a statistically significant difference between the groups.

2. **Number of Pregnancies**

The results in (Table 4) show that 15 patients (21.43%) had less than three pregnancies, while 43 patients (61.43%) had more than three pregnancies. There were 12 patients (17.14%) who had never been pregnant. The chi-square test showed a value of 25.06 with a statistical significance of less than 0.001, indicating a statistically significant difference between these groups.

3. **Breastfeeding**

The results indicate that 49 patients (70.00%) were breastfeeding, while 9 patients (12.86%) were not breastfeeding, and 12 patients (17.14%) were not breastfeeding. The chi-square test showed a value of 42.54 with a statistical significance of less than 0.001, indicating a statistically significant difference between the groups.

4. **Ovariectomy**

The results indicate that one patient (1.43%) underwent oophorectomy, while 69 patients (98.57%) did not undergo this procedure. Chi-square test shows a value of 66.05 with a statistical significance of less than 0.001, indicating a significant statistically significant difference between the groups. Based on the analysis of the Chi-square test, it is clear that the factors mentioned in the current study: menopause, type of breastfeeding, number of pregnancies and oophorectomy shown in (Table 4) show statistically significant differences, which means that these factors have a large and important effect in the given context. The current study confirmed the presence of a significant prevalence of osteoporosis as well as the high incidence of osteoporosis among postmenopausal women in various areas in Iraq, which was indicated by previous studies [16]. A study by Al-Hafidh et. al.[16] conducted on Iraqi women to identify osteoporosis in the lumbar spine concluded that it is more prevalent than osteoporosis in both menopausal and premenopausal women. On the other hand, an Indian study was conducted to determine bone mineral density in postmenopausal women and its impact on the prevalence of osteoporosis. A high percentage of normal bone mineral density was recorded in premenopausal and postmenopausal women, and it showed that the recorded percentage is (46.7%) before menopause in both groups. Also, the Indian study found normal bone mineral density, (45.1%) with osteoporosis and (8.2%) with osteopenia while postmenopausal women in particular had a high prevalence of normal bone mineral density, (50%) with osteoporosis and information about osteoporosis and (41.2%) with osteopenia [17].

Conclusion

It can conclude that the factors determined in the current study; menopause, type of breastfeeding, number of pregnancies and oophorectomy shown in result that show statistically significant differences, which means that these factors have a large and important effect in the given context. The statistical value is 2.468, which means that all the factors included do not measure statistically significant differences between males and females ($p > 0.05$). Therefore, there are no significant differences between the male and female in the effect of these factors on bones. The chi-square test indicates that the statistical value is 2.468, which means that all the factors included do not measure statistically significant differences between males and females ($p > 0.05$). Therefore, there are no significant differences between the sex in the effect of these factors on bones.

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Recommendations

Essential measures are required for people more information about osteoporosis, lifestyle modification, public education particularly dietary habit, and widespread distribution of and its prevention.The overall analysis highlights a significant effect of age and gender on incidence rates, with significant differences in some age groups. Further research may be necessary to understand the underlying factors contributing to these differences

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