

# The temporomandibular joints disorders in patients with osteoporosis

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## Abstract

**Background:** Osteoporosis is a skeletal and progressive behavioral disease with physically and psychologically significant consequences.

**Aims of the Study:** Evaluate the presence and effects of Temporomandibular Joints Disorders in osteoporotic patients.

**Materials and Methods:** Fifty-eight (58) patients with osteoporosis participated in this study as they were already diagnosed by Rheumatologists, physical and sport Rehabilitation physicians in Merjan Medical city/ Babylon – Iraq between period February and August 2019.

**Results:** Twenty-seven (27) patients with T. M. J clicking as anterior disk displacements, Seventeen (17) patients with spasm in muscles of mastication, and then finally Fourteen (14) out of 58 patients with subluxation and dislocation.

**Conclusions:** Osteoporosis can have a significant impact on oral health.

**Keywords:** Bone changes, oral findings, osteoporosis disease

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## INTRODUCTION

Osteoporosis can be defined as a progressive systemic skeletal disease with physically and psychologically significant consequences, identified by a reduction in the bone mass and/or bone mineralized density (BMD), in addition to a change of bone microarchitecture which consequently can lead to increase the chance of bone fragility and fractures as the fragile bone may be fractured on minimal trauma where otherwise, normally a micro-fracture does not occur.<sup>[1-6]</sup> In other words, patients with osteoporosis seem to be asymptomatic due to painless progress of bone loss until the disease becomes clinically

manifested and/or clearly observed as a result of trauma presenting as fracture.<sup>[1,7]</sup>

Osteoporosis is commonly noticed clinically during the fourth and fifth decades of life, it mostly occurs in females than males due to the possibility of hormonal changes, especially in postmenopausal females which can affect the quality of bone.<sup>[2,7-9]</sup> However, osteoporosis can also affect older men.<sup>[7-10]</sup>

As a result of significant impact and outcome of osteoporosis, it can be considered as a broad interesting disease related to the public health issue.<sup>[4-6,8]</sup>

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The skeleton which is mainly affected by osteoporosis is metabolically active tissue subjected to constant alterations and adaptative processes named bone formation and bone resorption which are likely to be disturbed by osteoporosis as bone resorption may become more frequent than bone formation.<sup>[1,4,11,12]</sup> Therefore, osteoporosis can also be considered as the most common metabolic bone disease which is characterized by low bone density.<sup>[1,4]</sup>

There are different risk factors which may lead to the development of osteoporosis such as inadequate absorption of nutrients especially Calcium (Ca) and Phosphorus caused by intestinal disorders which can lead to Vitamin D deficiency that has an impact on bone density.<sup>[3,13-15]</sup>

Generally, osteoporosis can affect any skeletal site<sup>[3,8,16]</sup> including Temporomandibular joint (TMJ) which is critical for mastication, occlusion and speaking.<sup>[17]</sup>

Osteoporosis can occur in the bony components of the joint which are the articular fossa, articular eminence of the temporal bone and the condyle of the mandible that is most commonly affected by bone resorption.<sup>[18-20]</sup> Moreover, functional harmony of the masticatory system may be disturbed by the impact of general bone loss on the skeleton caused by osteoporosis, which then can result in increase the chance of occurrence of TMJ problems such as Temporomandibular disorders (TMD);<sup>[3,7,21]</sup> therefore, patients suffer from pain, tenderness, clicking, weakness, shifting of the jaw to one side, protrusion of the mandible and occasional joint stiffness which can lead to limitation of mouth opening and adversely affects oral health.

TMJ is critical for jaw functional activity including mastication, occlusion and speech.<sup>[17]</sup> Problems of TMJ mainly include TMDs which can be defined as a group of problems and complicated conditions influencing TMJ and associated musculature and structures.<sup>[17,22]</sup>

TMDs can be categorised into Three types including myofascial pain disorders (myogenous), articular disorders (anterior disc displacement/internal derangement) and degenerative disorders (progressive degeneration).<sup>[17,22-24]</sup>

Multiple diagnostic methods of TMJ disorders including TMDs were recognized. The most broadly used diagnostic method is research diagnostic criteria (RDC/TMD)<sup>[25,26]</sup> which is used in this study because of its biopsychosocial approach for the diagnosis of TMJ disorders including TMDs.<sup>[27,28]</sup>

## Aims of the study

Examine and evaluate the presence and impact of TMJs disorders in patients with osteoporosis.

## MATERIALS AND METHODS

A favorable ethical opinion was obtained for this study from the Iraqi Ministry of Health. Fifty-eight (58) patients with osteoporosis participated in this study after a brief verbal explanation of it was presented to them by the researchers who performed this study. This study was self-funded and it was reviewed by the scientific committee of the University of Babylon after obtaining consent form. Power calculation of the sample size (58 patients) of this study was done by using G-Power and based on data of two previous studies<sup>[29,30]</sup> focusing on change in bone density of TMJs. The lower effect size (0.68) of<sup>[29]</sup> study was used to calculate the sample size of this study at 80% power.

Each participated patient signed a consent form before starting participation in the study. An appointment was arranged for each participated patient to confirm the presence of TMJs disorders and case sheet was used for each patient. All patients with osteoporosis were recruited from the Outpatient Department of the Rheumatology clinic in Merjan Medical city/Babylon – Iraq between the period February-August 2019, and all of them were already diagnosed by Rheumatologists, physical and sport Rehabilitation physicians.

Dual Energy X-ray Absorptiometry shown in Image 1 performed for all patients to show the osteopenia and changes in bones density.

TMJs were examined by oral medicine specialties using (RDC/TMD) diagnostic method.<sup>[25,26]</sup>

The standard criterion for the diagnosis of osteoporosis in postmenopausal women and older men is T-score of  $\leq -2.5$  at the lumbar spine, femur neck or total hip by bone mineral density testing.



**Image 1:** Dual Energy X-ray absorptiometry machine

### Inclusion criteria

Patients can converse in Arabic and have adequate understanding of the language to take part in the speaking, listening and reading required in the study; Patients are diagnosed with osteoporosis; Patients are  $\geq 18$  years of age; Patients can provide consent form to take part in the study.

### Exclusion criteria

Patients are diagnosed with other bony changes not including osteoporosis; Patients have had an injury in the TMJs area; Patients have lacking in the ability to understand the study and provide consent form; Patients are  $< 18$  years of age.

## RESULTS

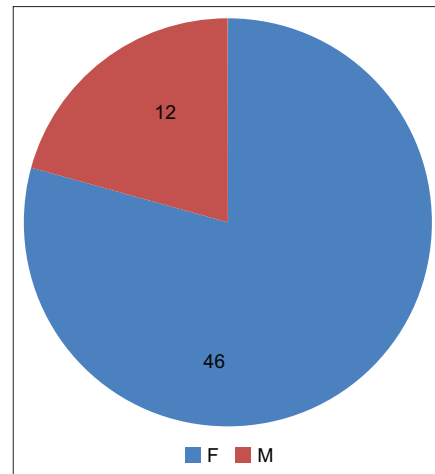
A total of 172 patients with osteoporosis were recruited and were verbally approached to determine if they had an interest to participate in the study by their clinical staff. Of these, 91 (53%) declined participation in the study. The remaining 81 patients (47%) were interested in participating and discussed the study with the clinical researchers. An appointment was arranged for each patient who had an interest to participate in the study after signed a consent form. Of the participated patients ( $n = 81$ ), 61 (75%) were diagnosed with TMJs disorders by the clinical researchers and the remaining 20 (25%) were considered ineligible because they did not have TMJs disorders and then excluded from the study. As a result of no one of them participated patients asked to withdraw from the study after signing the consent form, the data of the last three patients (4%) diagnosed with TMJs disorders were not included in the results of the study. Therefore, the data of 58 (72%) osteoporotic patients diagnosed with TMJs disorders were only included in the results because the sample size of this study is 58 patients. The number of female patients participated in this study was Forty Six 46 out of 58 osteoporotic patients, while the number of male patients was 12.<sup>[19]</sup> Therefore, the majority of patients participated in the study were females (79%) as shown in Figure 1.

The age of patients ranged from 48 to 66 years (Mean 54.3). The Fifty-eight (58) patients participated in this study were with the following TMJs disorders:

Twenty-seven (27) (47%) out of 58 patients with TMJ clicking as anterior disk displacements.

Seventeen (17) (29%) out of 58 patients with spasm in muscles of mastication.

1. Fourteen (14) (24%) out of 58 patients with subluxation and dislocation.



**Figure 1:** Patients' gender distribution

Descriptive statistics were used in this study as the study based on the percentage of TMJ disorders occurrence in patients with osteoporosis.

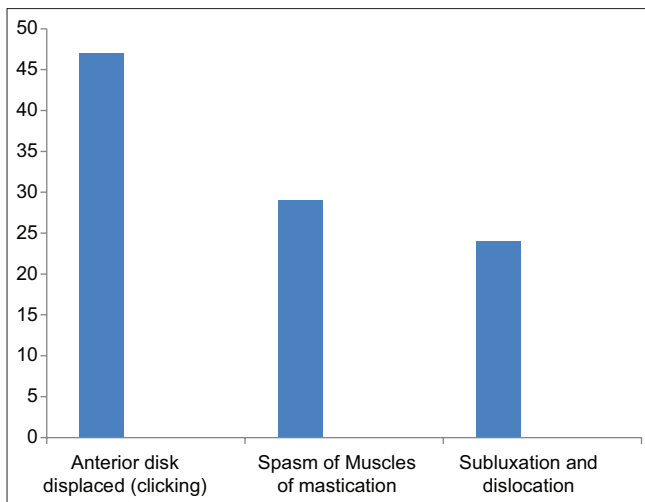
These results are also showed by the following Figure 2:

## DISCUSSION

In this study, female patients were more than male patients. The majority of females is consistent with the data of previous studies.<sup>[2,3,7,9]</sup> The cause of differences in gender-related to osteoporosis may be due to biological effects of changes in female reproductive hormones (estrogen) especially in postmenopausal females as hormonal changes can adversely affect bone density and strongly determine the rate of bone resorption.<sup>[2,3,7,9]</sup> On the other hand, osteoporosis can also occur in older males.<sup>[3,7,9]</sup> In addition to that, female patients had more symptoms of chronic TMDs than those of male patients due to the probability of increase hormonal changes (especially estrogen) and emotional stress in middle age female patients than male patients.<sup>[17,31-33]</sup>

The mean age of patients participated in this study was about 54 years. This is in contrast with the findings of<sup>[3-5,7-9,13,16,18,19,25,29,31-36]</sup> who found that osteoporosis clinical manifestation can be seen in patients during fourth and fifth decades of their life.

Regarding osteoporosis and TMJ problems, Kim *et al.* on 2016<sup>[37]</sup> revealed that any changes related to organs in the human body such as pathological events connected with the health status of other human organs or structures. One of the health compromised or complications in these patients are bones pathological changes and associated structures (orthogenic or myogenic), one of the main bone dysfunction and muscles fatigue or spasms in patients with



**Figure 2:** Temporomandibular joint disorders in osteoporotic patients

osteoporosis are TMDs and myofascial pain dysfunction syndrome.<sup>[37]</sup>

Moreover, TMDs can be classified into three types which are myofascial pain disorders, articular disorders and degenerative disorders.<sup>[17,22-24]</sup> Myofascial pain is considered as the most common type of TMDs, but is not frequently seen in the articular changes of TMJ.<sup>[17]</sup> Abnormal disc position (disc displacement with or without reduction) can be seen in articular disorders.<sup>[17,22]</sup> Secondary osteoarthritis and progressive degeneration can occur as a result of chronic articular disorders.<sup>[17,24]</sup>

The hypothesis related to bony changes including TMJ area is due to reduction in proliferating capacities or abilities of osteoblasts of all bones in the human body and condylar bone is one of them.<sup>[38,39]</sup>

The fibrocartilage in TMJ located above the condylar bone of the mandible, this bone is susceptible to inflammatory damage due to systemic disease that makes bony changes like arthritic features,<sup>[10,36]</sup> compromised health of patients with osteoporosis like psychological and emotional stressful conditions occurred due to this disease then lead to degenerative features of mandibular condyles.

Furthermore, the development of general bone loss in the skeleton can be provoked by the presence of poor habits and medical conditions/disorders which may lead to disturbance in the masticatory system and therefore can increase the chance of occurrence of TMDs.<sup>[5,21]</sup>

In addition to that, deficiency of vitamin D and Ca associated with osteoporosis and reduction of bone mass density (BMD) can cause abnormalities and degenerative

changes of condylar bones.<sup>[36]</sup> However, prevention of osteoporosis can be established by using Vitamin D supplements with regular exercise for maintaining the health condition of the bone.<sup>[7,34]</sup>

Although there is a significant relationship between osteoporosis and TMJ problems, the osteoporosis prevalence seems not to be of importance regarding clinical and/or radiographic findings of osteoarthritis with degenerative changes in TMJs.<sup>[34,35]</sup>

Ultimately, this study is subject to limitation which includes a dearth in the literature about TMJs disorders and osteoporosis. Another limitation is the predominance of female patients with osteoporosis and TMJs disorders than male patients which might be due to the over recruitment of female patients.

## CONCLUSIONS

Osteoporosis can have a significant impact on the oral and dental health of the patient through increasing the chance of occurrence of TMJ problems, especially the TMDs which are likely the main causes of jaw functional limitation through the presence of pain, tenderness, muscular fatigue, clicking and stiffness of the jaw.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Abdel Moneim RA, Mostafa A, Abbass MM. In treating glucocorticoids induced osteoporosis in temporomandibular joint of albino rats; which are more effective Microvesicles or Mesenchymal stem cells? *Egypt J Histol* 2020;43:849-62.
2. Al Bayati RM, Saliem SS, Al Nakib LH. Relation of Gonial Angle Index to osteoporosis and age using CBCT in female subjects. *J Baghdad Coll Dent* 2018;325:1-6.
3. Bandela V, Munagapati B, Karnati RK, Venkata GR, Nidudhur SR. Osteoporosis: Its prosthodontic considerations – A review. *J Clin Diagn Res* 2015;9:E01-4.
4. Bonte DC, Motoc M, David DL, Lighezan R, Anghel A, Bonte OH, Zosin II, *et al.* The Correlation between the Values of Urinary Pyridinoline and the Response to Therapy in Osteoporosis as Evaluated by DEXA (Dual Energy X-Ray Absorptiometry). *Journal of TMJ* 2010; 60 (3):209-214.
5. Garnero P, Delmas PD. 4 Bone markers. *Baillieres Clin Rheumatol J* 1997;11:517-37.
6. Lindsay R, Burge RT, Strauss DM. One year outcomes and costs following a vertebral fracture. *Osteoporos Int* 2005;16:78-85.
7. Gupta R, Nagpal A, Abrol S, Ruthwal Y, Mahajan M. Osteoporosis: A silent disease affecting edentulous patients at an alarming rate. *Ann Prosthodont Restor Dent* 2017;3:50-1.
8. Dumbuya A, Gomes AF, Marchini L, Zeng E, Connick CL, Melo SL,

- et al.* Bone changes in the temporomandibular joints of older adults: A cone-beam computed tomography study. *Special Care Dent* 2020;40:84-9.
9. Gaetti-Jardim EC, Santiago-Junior JF, Goiato MC, Pellizer EP, Magro-Filho O, Jardim Junior EG. Dental implants in patients with osteoporosis: A clinical reality? *J Craniofac Surg* 2011;22:1111-3.
  10. Zhou Y, Al-Naggar IM, Chen PJ, Gasek NS, Wang K, Mehta S, *et al.* Senolytics alleviate the degenerative disorders of temporomandibular joint in old age. *Journal of Aging Cell* 2021; 20(7): e13394.
  11. Robins SP. Collagen crosslinks in metabolic bone disease. *Acta Orthop Scand Suppl* 1995;266:171-5.
  12. Kleerekoper M, Gold DT. Osteoporosis prevention and management: An evidence-based review. *Clin Obstet Gynecol* 2008;51:556-63.
  13. Weaver CM, Alexander DD, Boushey CJ, Dawson-Hughes B, Lappe JM, LeBoff MS, *et al.* Calcium plus vitamin D supplementation and risk of fractures: An updated meta-analysis from the National Osteoporosis Foundation. *Osteoporosis International* 2016; 27:367-76.
  14. Jeffcoat MK. Osteoporosis: A possible modifying factor in oral bone loss. *Ann Periodontol* 1998;3:312-21.
  15. Lindsay R, Cosman F. Osteoporosis, chapter 333 in Harrison's principle of internal medicine In: Kasper DL, Fauci AS, Longo DL *et al.* Mc Graw Hill (New York, United States), 16 Ed 2005; 2:2268-78.
  16. Grampp S, Jergas M, Lang P, Genant HK, Gluer CC. Quantitative assessment of osteoporosis: Current and future status; Osteoporosis: Diagnosis and treatment. Sartoris DJ, Informa Health Care (New York, United States) 2000; Chap 8:233-67.
  17. Morel M, Ruscitto A, Pylawka S, Reeve G, Embree MC. Extracellular matrix turnover and inflammation in chemically-induced TMJ arthritis mouse models. *PLoS One* 2019;14:e0223244.
  18. de Leeuw R. Internal derangements of the temporomandibular joint. *Oral Maxillofac Surg Clin North Am* 2008;20:159-68, v.
  19. Dijkgraaf LC, de Bont LG, Boering G, Liem RS. The structure, biochemistry, and metabolism of osteoarthritic cartilage: A review of the literature. *J Oral Maxillofac Surg* 1995;53:1182-92.
  20. Tatli U, Ustün Y, Kürkçü M, Benlidayı ME. Effects of zoledronic acid on physiologic bone remodeling of condylar part of TMJ: A radiologic and histomorphometric examination in rabbits. *ScientificWorldJournal* 2014;2014:649026.
  21. Klemetti E. A review of residual ridge resorption and bone density. *J Prosthet Dent* 1996;75:512-4.
  22. Scrivani SJ, Keith DA, Kaban LB. Temporomandibular disorders. *N Engl J Med* 2008;359:2693-705.
  23. Al-Baghdadi M, Durham J, Araujo-Soares V, Robalino S, Errington L, Steele J. TMJ disc displacement without reduction management: A systematic review. *J Dent Res* 2014;93:37S-51S.
  24. Wang XD, Zhang JN, Gan YH, Zhou YH. Current understanding of pathogenesis and treatment of TMJ osteoarthritis. *J Dent Res* 2015;94:666-73.
  25. Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: Review, criteria, examinations and specifications, critique. *J Craniomandib Disord* 1992;6:301-55.
  26. John MT, Zwijnenburg AJ. Interobserver variability in assessment of signs of TMD. *Int J Prosthodont* 2001;14:265-70.
  27. Zakrzewska JM. Classification issues related to neuropathic trigeminal pain. *J Orofac Pain* 2004;18:325-31.
  28. Suvinen TI, Reade PC, Hanes KR, Kononen M, Kempainen P. Temporomandibular disorder subtypes according to self-reported physical and psychosocial variables in female patients: A re-evaluation. *J Oral Rehabil* 2005;32:166-73.
  29. Alyasiry A, Aljammali ZM, Almosawy AM, Alrubbaie S. Dental health in osteoporotic women. *Res J Pharm Technol* 2015;8:1383.
  30. Jagur O, Kull M, Leibur E, Kallikorm R, Loorits D, Lember M, *et al.* Relationship between radiographic changes in the temporomandibular joint and bone mineral density: A population based study. *Stomatologija* 2011;13:42-8.
  31. Fillingim RB, Ohrbach R, Greenspan JD, Knott C, Diatchenko L, Dubner R, *et al.* Psychological factors associated with development of TMD: The OPPERA prospective cohort study. *J Pain* 2013;14:175-90.
  32. Greenspan JD, Slade GD, Bair E, Dubner R, Fillingim RB, Ohrbach R, *et al.* Pain sensitivity and autonomic factors associated with development of TMD: The OPPERA prospective cohort study. *J Pain* 2013;14:T63-74.
  33. Slade GD, Bair E, Greenspan JD, Dubner R, Fillingim RB, Diatchenko L, *et al.* Signs and symptoms of first-onset TMD and sociodemographic predictors of its development: The OPPERA prospective cohort study. *J Pain* 2013;14:T20-32.
  34. Anil S, Preethanath RS, AlMoharib HS, Kamath KP, Anand PS. Impact of osteoporosis and its treatment on oral health. *Am J Med Sci* 2013;346:396-401.
  35. Back K, Ahlqvist M, Hakeberg M, Bjorkelund C, Dahlstrom L. Relation between osteoporosis and radiographic and clinical signs of osteoarthritis/arthrosis in the temporomandibular joint: A population-based, cross-sectional study in an older Swedish population. *Gerodontology* 2017;34:187-94.
  36. Cevidanes LH, Walker D, Schilling J, Sugai J, Giannobile W, Paniagua B, *et al.* 3D osteoarthritic changes in TMJ condylar morphology correlates with specific systemic and local biomarkers of disease. *Osteoarthritis Cartilage* 2014;22:1657-67.
  37. Kim OS, Shin MH, Song IH, Lim IG, Yoon SJ, Kim OJ, *et al.* Digital panoramic radiographs are useful for diagnosis of osteoporosis in Korean postmenopausal women. *Gerodontology* 2016;33:185-92.
  38. Karoli Y, Karoli R, Fatima J, Manhar M. Study of hepatic osteodystrophy in patients with chronic liver disease. *J Clin Diagn Res* 2016;10:C31-4.
  39. Patel N, Muñoz SJ. Bone disease in cirrhosis. *Clin Liver Dis (Hoboken)* 2015;6:96-9.