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Research Article

The Impact of Osteoporosis on Teeth Decay in relation to Salivary Vitamin D among Menopause in Baghdad city, Iraq

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ABSTRACT

Background: Osteoporosis is a systemic skeletal disorder that has an impact on general health, dental health and salivary composition. The mineralization of teeth happens simultaneously with that of the skeleton, but if mineral metabolism is disrupted, tooth failures will resemble those that affect bone tissue. Vitamin D plays a key role in bone and tooth mineralization.

Objective: to evaluate the impact of osteoporosis on teeth decay in relation to salivary vitamin D among menopause in Baghdad city.

Subjects and Methods: This study was cross sectional study. The study group consists of 45 menopausal women with osteoporotic disease as appeared in dual energy X-ray absorptiometry (DEXA) scan. The control group consists of 45 menopausal women without osteoporosis as appeared in (DEXA) scan. Dental caries was examined according to WHO (2013). Biochemical salivary analysis made for vitamin D. Statistical Analysis of the data were carried out using SPSS version 21.

Results: The percentage of dental caries occurrence was 100% among groups. Results revealed that DMFT value was higher but statistically not significant among osteoporotic women. Concerning DMFS components, the data showed that DS, MS and FS was higher among study group but statistically not significant. Salivary vitamin D is lower in study group with significant difference.

Conclusion: The caries experience was higher in osteoporotic women and missing teeth were reported to be most common in both groups. Salivary vitamin D is lower in osteoporotic group. Therefor old adult women need special oral health preventive and educational programs.

Introduction

Osteoporosis is a condition that promotes low bone mass, degeneration of bone tissue, and disturbance of bone microarchitecture. It can affect bone strength and increase the risk of fractures (1). Skeletal fragility increases the likelihood of fracture and is closely correlated with mortality and injury risk (2-3). Since osteoporosis causes bone loss without any noticeable symptoms, it is frequently referred to as a silent disease. Due to the fact that osteoporosis does not manifest symptoms until a bone fracture, the

lack of any symptoms may last for decades. (4). whenever there is an imbalance between production of new bone and the resorption of old bone, osteoporosis develops. Either not enough new bone is produced by the body, too much old bone is reabsorbed, or both are occurring. Calcium and phosphate are two elements that are crucial for healthy bone growth. Bone development as well as bone tissue could deteriorate if there is insufficient calcium in the diet or when the body cannot absorb appropriate calcium from it. As a result, the bones could deteriorate, making them more brittle and prone to breaking. In addition, a deficiency in specific hormones is the primary contributor to osteoporosis. (5). The imbalance between resorption and production rates brought on by menopause and aging increases the chance of fracture (1). Studies found that bone mass decrease by 1% per year from midlife onwards (6). Due to the strong structural similarities between skeletal bones and teeth, both can be impacted by the same metabolic disruptions, leading one to conclude that the same pathways could cause both bone loss and tooth decay (7). Osteoporotic women are three times as likely to lose their teeth in compaire to normal women (8).

According to reports, one of the oldest and most prevalent diseases affecting people is dental caries. (9). Once plaque collects on a tooth's surfaces, it causes dental caries by converting the free sugars in food and beverages into acids that gradually dissolve the tooth. It impacts the calcified tissue of teeth and results in that the organic component dissolving and the inorganic component demineralizing. It is complex disease that is influenced by a number of variables, primarily by the availability of fermentable sugar, cariogenic microbial flora and host factors with time, also a number of risk factors playing a role in their onset and progression (10-11). Depending on the extent, stage and severity of dental caries, carious lesions are managed (9).

The enamel, dentin, and cementum that make up teeth are three different hard tissues that are mineralized organs while alveolar bone is surrounded the teeth. The mineralization of teeth happens simultaneously with that of the skeleton, however if mineral metabolism becomes disrupted, tooth failures will resemble those that affect bone tissue. Vitamin D is essential for mineralization of bones and teeth, and when levels disrupt it can result in the "rachitic tooth" which is a malformed and hypomineralized organ that makes the tooth brittle and decayed fast (12-13). The biochemical bone markers are not useful in the diagnosis of postmenopausal osteoporosis but may have a role in monitoring the progress and response to treatment (14). Generally, inadequate sun light exposure with adequate Ultra violate B rays (exogenous factor) is the main contributor to vitamin D deficiency (15). Besides that, the nutritional insufficiency that caused by insufficient vitamin D intakes or inherited abnormalities of absorption and metabolic conversion can also result in vitamin D inadequacy (16). This study was conducted to evaluate the impact of osteoporosis on teeth decay in relation to salivary vitamin D among menopause in Baghdad city/Iraq.

Subjects and Methods

The present research was carried out between December 2021 and April 2022. Ethical approval was achieved from ethical committee at University of Baghdad, College of Dentistry and ministry of health to examine the women. In this comparative cross sectional study, all women participating in this study were attending the Medical city teaching hospital in Baghdad city, They were with the age ranged from (45-65) years old. The study group consists of 45 women with osteoporosis as diagnosed in DEXA scan. The control group consists of 45 women without osteoporosis as diagnosed in DEXA scan. All women with a history of early menopause were excluded because early menopause i.e., <45 years without hormone replacement therapy predisposes to osteoporosis (17). The present study used a control group (adult Women) who were similar as possible as to age, gender, social structure and geographic position except in osteoporotic condition were examined using the same DEXA Scanning for diagnosis. Exclusion criteria include that all women were without medical disorders such as; artificial joints; history of untreated cancer or recent cancer therapy; patients with chronic renal failure, thyroid gland diseases; metabolic bone diseases and current use of medications such as corticosteroids, thyroid hormone, insulin dependent therapy and anti-Seizure drugs and other supplements such as receiving multivitamins, calcium and vitamin D3 supplements and smoker women.

As any questionnaire format, questions about personal name, age, medical status and menstruation status are taken from the women. Oral examination was done according to the World Health Organization WHO (2013). The samples of whole unstimulated saliva were collected by spitting method, then biochemical analysis had done by using vit. D kit. The vitamin D's kit (Biont - china) used enzyme-linked immune sorbent assay (ELISA) based on the Biotin double antibody sandwich technology to assay the Human vitamin D (VD3). Data description, analysis and presentation were performed using Statistical Package for social Science (SPSS version 21) (Chicago, USA, Illinois). Result were displayed as descriptive analysis in which frequencies and percentage for nominal variables, mean and Standard error (SE) for quantitative variable, and data inferential analysis were performed using independent sample T test for testing the difference between two groups, also Receiver Operating Characteristic (ROC) was used which it is a graphical method used for diagnostic capability as for discrimination or differentiation is varied.

Results

The mean of DMFS showed that DMFS was higher in the study group than in the control but with no significant difference. The MS was higher than DS and FS in both groups as shown in table (1). While the mean of DMFT showed that caries was higher in the study group than in the control but with no significant difference. The missing teeth were higher than decayed and filling teeth in both groups as shown in table (2).

Mean value and standard error among the two groups showed that salivary vitamin D was lower in the study group than that in the control with significant different as shown in table (3). While figure (1) and table (4) showed the receiver operating characteristics curve for salivary vitamin D. The results showed salivary vitamin D had sufficient diagnostic ability for differentiation with significant result.

Table 1: Mean value and Standard Error of caries severity (DS, MS, FS, DMFS) among study and control groups

Dental caries	Groups				Statistical test	
	Study		Control			
	Mean	±SE	Mean	±SE	T test	P value
DS	5.600	1.260	5.067	0.834	0.353	0.725
MS	55.156	6.067	46.933	5.891	0.972	0.334
FS	4.911	1.500	3.689	0.917	0.695	0.489
DMFS	65.667	5.993	55.689	5.720	1.204	0.232

Table 2: Mean value and Standard Error of caries experience (DT, MT, FT, DMFT) among study and control groups

Dental caries	Groups				Statistical test	
	Study		Control			
	Mean	±SE	Mean	±SE	T test	P value
DT	2.978	0.460	3.000	0.458	0.034	0.973
MT	11.267	1.282	9.733	1.245	0.858	0.393
FT	1.689	0.454	1.800	0.374	0.189	0.851
DMFT	15.934	1.178	14.533	1.109	0.865	0.389

Table 3: Mean value and standard error of vitamin D among study and control groups.

Variables	Groups				Statistical test	
	Study		Control			
	Mean	±SE	Mean	±SE	T test	P value
Vitamin D	18.694	1.148	23.958	1.427	2.874	0.005

Table 4: Receiver Operating Characteristic Curve for salivary vitamin D

Test Result Variable(s)	Area		%Sensitivity	%Specificity	p value	
Vitamin D	0.664	Sufficient	84.4	35.6	0.007	Sig.

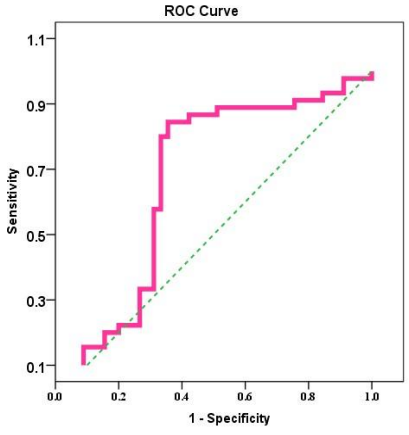

Figure 1: Receiver Operating Characteristics Curve for salivary vitamin D

Discussion

This study was designed to evaluate the impact of osteoporosis in menopause on teeth decay in relation to salivary vitamin D in Baghdad city/Iraq. All women were attending Medical City Teaching Hospital in Baghdad city in Iraq. Any tooth surface in the oral cavity that has had dental plaque accumulation over time may have dental caries (18). In the present study the DMFS/T indices were used for the diagnosis and recording of dentition health status. However, this index might lead to underestimation of the D component because of not using the bitewing radiographs to diagnose interproximal caries. In this study missing teeth were high in both study and control groups, and this is because of the study sample were old adults and there were several barriers to self-care and professional care in addition to poor dental health knowledge (19), also, may be due to low socioeconomic status and educational level lead to increase the missing teeth. Pan et al. suggested poor oral hygiene as a major contributing factor for tooth loss during menopause, rather than bone mineral density (20). Despite of there is no significant differences between osteoporotic and control groups, but still the osteoporotic patients have higher missing teeth compare with the control group and that because of the patient may suffer long-term disability (19). Iraqi studies among patients with osteoporosis had found that periodontal tissue destruction and number of missing teeth were higher in osteoporotic patients than in non-osteoporotic (5, 21). According to the decayed fraction of the present study, data analysis found that in spite of no significant differences between both groups, but there was slight increase of decade teeth in the osteoporotic patients and that is because low bone mineral density in osteoporotic women. Also, many other studies showed that there is increasing in plaque index and dental caries (DMFT) during menopause because of the changing in hormones in which they would affect salivary flow rate and might increase dryness of the mouth (22-26).

Numerous biological systems depend on vitamin D to keep them in balance (27-29). Although vitamin D is unquestionably crucial for maintaining calcium and bone homeostasis, its function in the other systems is less clear. (30). In present study, findings showed that there was decrease in salivary vitamin D among osteroporotic group with significant differences between study and control group. Low vitamin D may facilitate topical demineralizing of teeth, in a similar

way to its known action on bone, via reduced concentrations of calcium and phosphate ions (31-32). In a study done by Botelho et al. (16), they found that vitamin D deficiency is highly implicated with oral diseases and has been linked with a higher risk of tooth defects, caries, periodontitis and oral treatments failure.

Conclusion

Dental caries and tooth loss are the common oral health problems in older adults causing major public health issue. In addition, their underlying medical conditions, functional disability and cognitive impairment make dental treatment highly challenging, and unavoidably increase the burden in our health care system. Also, decrease vitamin D is common in osteoporotic menopausal women. That entire make the importance of giving all menopausal women good instructions about oral health care and giving information about the good source of diet that contain vitamins, moreover, sun exposure may increase the level of vitamin D in osteoporotic women.

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Conflict of Interest

Authors declare no conflict of interest.

Data availability

Data are available upon reasonable request.

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