

Ministry of Higher Education and
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The Relationship Between Sensorineural Hearing Loss And Vitamin D3 & Ca Deficiency

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(يَرْفَعُ اللَّهُ الْكَافِرِينَ مَنْ كَفَرَ وَالْكَافِرِينَ أَوْبُوا)

الْعِلْمِ كَارِجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ)

«سورة المجادلة: الآية ١١».

Abstract

Background: Hearing loss can be broadly separated into two categories: conductive (problems in delivering sound to the inner ear) and sensorineural (problems of the inner ear, cochlea and the auditory nerve that connects the inner ear to the brain. Sensorineural hearing loss happens when there is damage to tiny hair cells in the cochlear and/or the auditory nerve. Low concentrations of vitamin D3 a key regulator of calcium absorption and bone metabolism, were linked to hearing loss in an early case series.

Aim: The purpose of this study is to assessment of the relation between vitamin D3 status, total calcium, and sensorineural hearing loss.

Subject and methods: The sample size was 100 cases. Trained very well to interview the questionnaire carefully and in scientific way to avoid any bias. Respondents were assured that the information obtained would be confidential and used only for statistical purposes.

Results: The total cases of study was (100) . About (50%) of cases had sensorineural hearing loss . Cases with sensorineural hearing loss about (80%) of them had vitamin D3 deficiency and Calcium deficiency and (20%) of them had normal vitamin D3 and normal Calcium level . (50%) of cases had control hearing , about (60%)of them had vitamin D3 deficiency and Calcium deficiency and (40%)of them had normal vitamin D3 and normal Calcium level .

Conclusions: According to the results of the present study, there was correlated between vitamin D3 deficiency and calcium deficiency in patients with sensorineural hearing loss.

Keywords: Sensorineural Hearing loss, Vitamin D3, Calcium.

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Introduction

Hearing loss (HL) affects nearly two-thirds of adults aged ≥ 70 years old in the US population . Age-related hearing loss is a disabling condition and has been found to be linked to increased risk of falls, depressive symptoms, and the development of dementia in the elderly . Hearing loss in the elderly may be related to normal aging, noise exposure, medical comorbidities, nutritional status, and is likely genetically influenced.[1]

Hearing loss can be broadly separated in two categories : conductive hearing loss (problems in delivering sound to the inner ear) and sensorineural hearing loss (problems of the inner ear, cochlea and the auditory nerve that connects the inner ear to the brain).[2]

On the other hand, though the causes of sensorineural hearing loss are unknown and the case is classified as idiopathic . The identified causes of the disease can be trauma, infection, neoplasm, blood vessel diseases , autoimmune disease . [3]

Further more , the presence of vitamin D3 receptor in the inner ear it seems reasonable that deficiency of this vitamin can cause problems in this area .[4]

vitamin D3 deficiency or its metabolic derivatives 25-OHD and 1.25(OH)₂D may directly lead to auditory dysfunction or create secondary effects by disturbing the metabolism of calcium. Such factors may primarily interfere with the physiological mechanisms of the inner ear. Alternatively, secondary functional problems can be caused by disrupting the morphology of the neurosensory epithelium or the supporting bone structure of the optic capsule. In fact, deficiency of ionized calcium may adversely affect transmission of the nerve action

potentials generated by the cochlea by inhibiting the release of transmitter substances at the neural synapse and impairing neuronal excitability .[5]

Therefore, researchers believe that vitamin D3 deficiency may be directly or indirectly associated with hearing loss . In this regard, it has been reported that vitamin D3 deficiency is very common in patients with ear, nose and throat problems . [6]

Several studies have indicated that vitamin D3 deficiency is associated with sensorineural hearing loss . According to these studies, the cause is most likely the demineralization of the cochlea resulting in a metabolic type of sensorineural hearing loss . Therefore, due to the high prevalence of vitamin D3 deficiency and the lack of evaluation of the effect of this vitamin on the recovery of these patients the present study was conducted to determine the prevalence of vitamin D3 deficiency in patients with sensorineural hearing loss . [7]

Subjects and methods

Study design

The current study is cross section study type was carried out in Baquba teaching hospital from 17th of November 2022 to the 29th of March 2023. The study design was by stratified sampling.

Sample size and sample procedure

The sample size was 100 cases. Trained very well to interview the questionnaire carefully and in scientific way to avoid any bias. Respondents were assured that the information obtained would be confidential and used only for statistical purposes.

Questionnaire and Interview

The questionnaire used for data collection was designated in English language. Interviewers administer it and it includes mainly closed questions about name , age , type of hearing loss , duration of hearing loss , degree of hearing loss , unilateral or bilateral , associated diseases , supplements taken , how much time spent in the sun , level of vitamin D3 , level of calcium .

Data Analysis and Presentation

All data management and analysis was done by using manual statistical methods. Data have been represented suitable tables and figures.

Results

The total sample of study was (100) cases , male was (63) and female was (37) , about 25 of them were (20-29) years old , 20 of them were (30-39) years old , 14 of them were (40-49) years old , 16 of them were (50-59) years old , 25 of them were (60-74) years old .

Table 1: *The correlations of sensorineural Hearing loss with vitamin D3.*

	Sensorineural Hearing loss	Total
D3 deficiency	(40) 80%	(50) 100%
Normal vitamin D3	(10) 20%	(50) 100%

This table shows that about (80 %) of cases with sensorineural hearing loss had vitamin D3 deficiency and (20%) had normal vitamin D3 level .

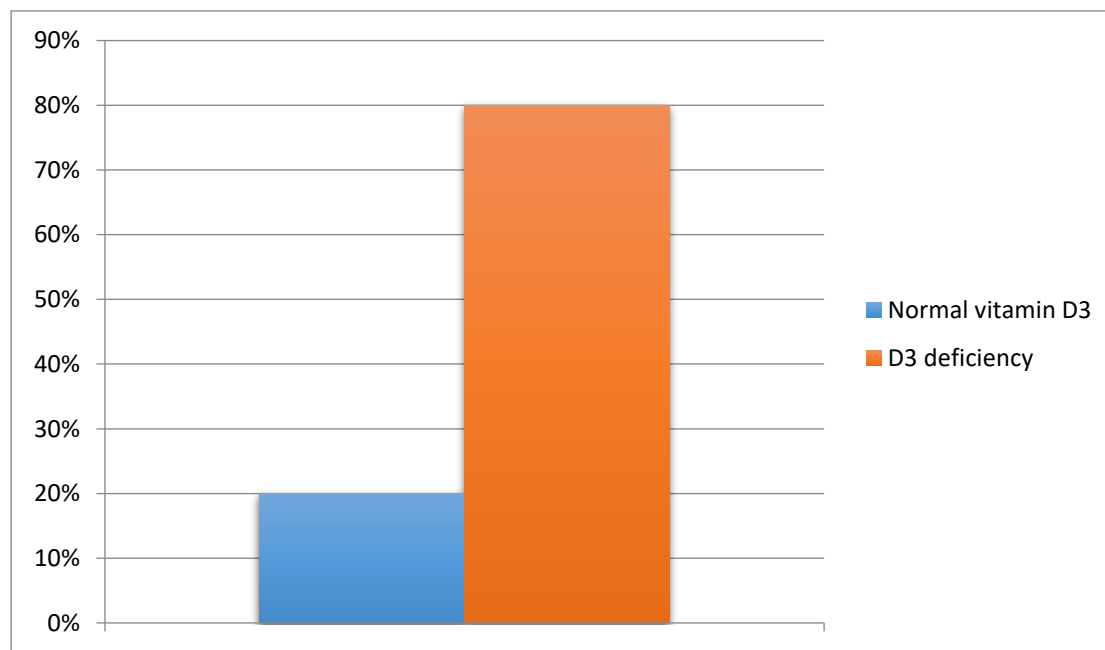


Figure 1: *The correlations of sensorineural hearing loss with vitamin D3 deficiency.*

Table 2: The correlations of sensorineural Hearing loss with Calcium level.

	sensorineural Hearing loss	Total
Calcium deficiency	(40) 80%	(50) 100%
Normal Calcium	(10) 20%	(50) 100%

This table shows that about (80 %) of cases with sensorineural hearing loss had Calcium deficiency and (20%) had normal Calcium level .

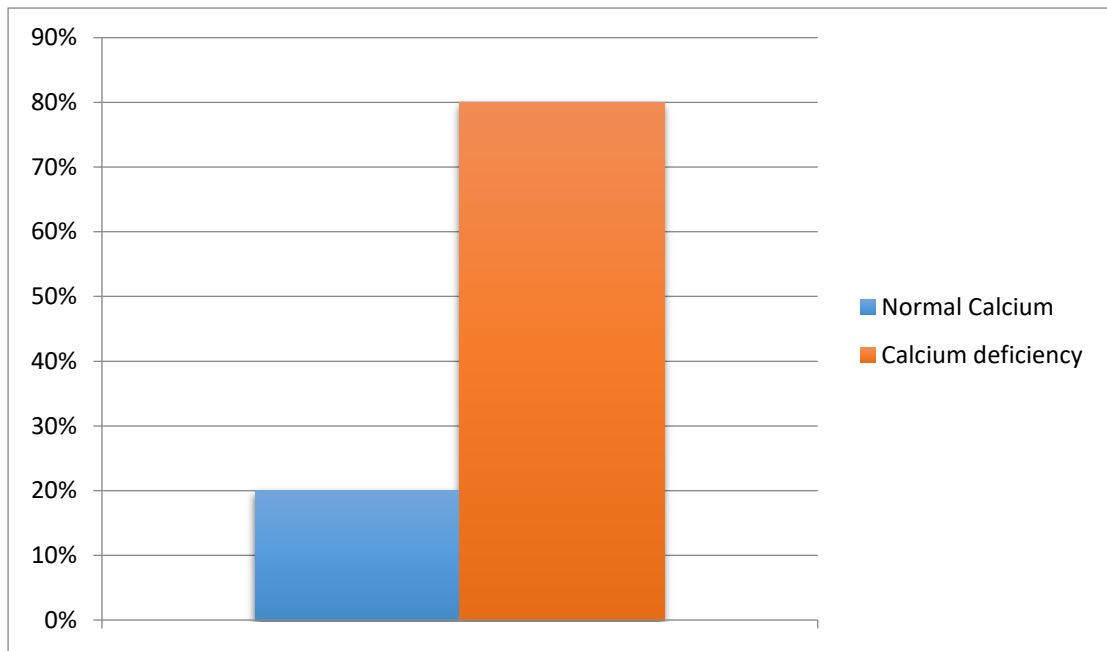


Figure 2 : The correlations of sensorineural hearing loss with Calcium level .

Table 3: The correlations of control hearing with D3 deficiency.

	<i>control hearing</i>	Total
D3 deficiency	(30) 60%	(50) 100%
Normal D3	(20) 40%	(50) 100%

This table shows that about (60%) of cases with control hearing had vitamin D3 deficiency and (40%) had normal vitamin D3 level.

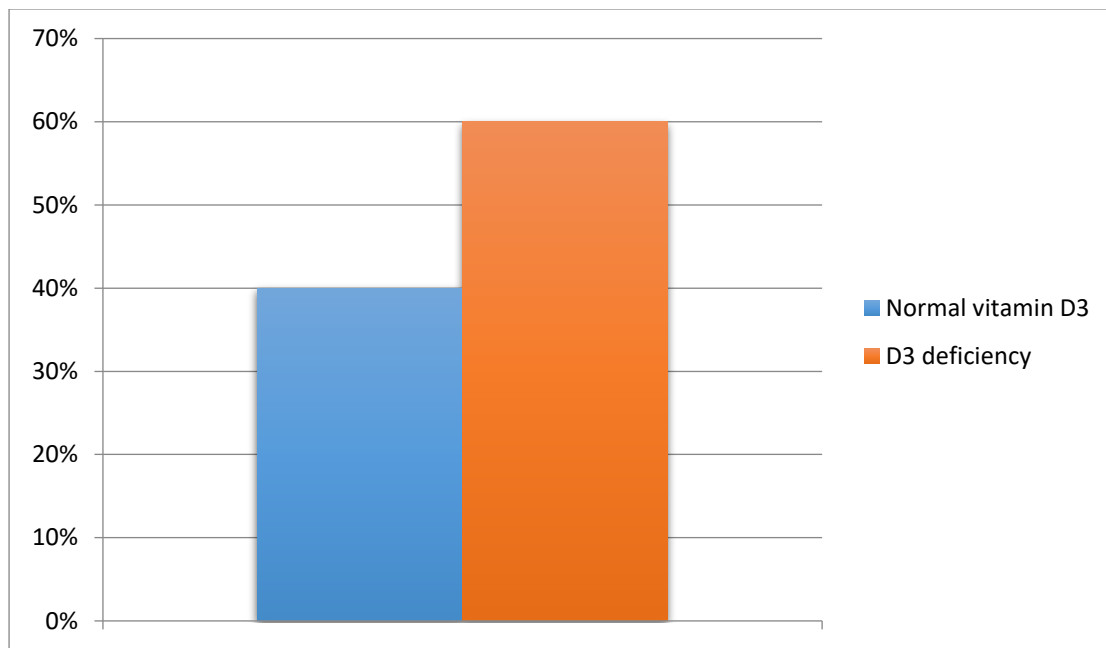


Figure 3 : The correlations of control hearing with vitamin D3 deficiency

Table 4: The correlations of control hearing with calcium deficiency.

	<i>control hearing</i>	Total
calcium deficiency	(30) 60%	(50) 100%
Normal Calcium	(20) 40%	(50) 100%

This table shows that about (60%) of cases with control hearing had Calcium deficiency and (40%) had normal Calcium level .

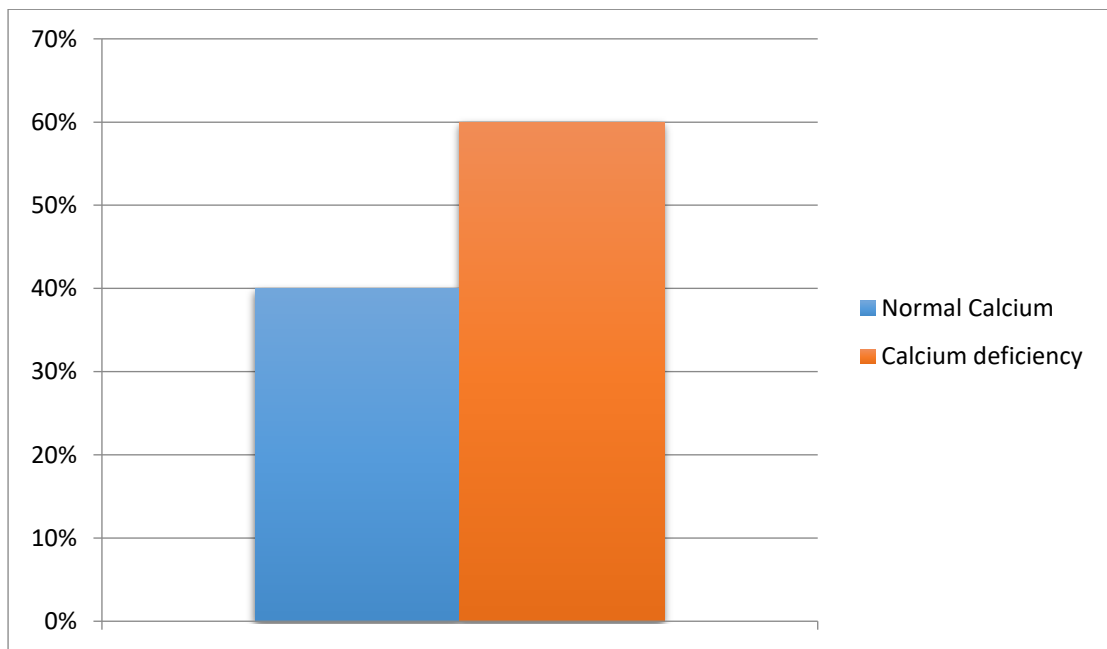


Figure 4: The correlations of control hearing with Calcium level.

Table 5 : The comparisons between sensorineural hearing loss and control hearing with D3 deficiency and Calcium deficiency.

	Sensorineural Hearing loss	Control hearing	Total
D3 deficiency	40 (80%)	(30) 60%	100
Calcium deficiency	40 (80%)	(30) 60%	100

This table shows the relation between vitamin D3 and Ca deficiency and Sensorineural Hearing loss, that there is about (80%) of cases with Sensorineural Hearing loss had vitamin D3 and Calcium deficiency and (60%) of cases with control hearing had vitamin D3 and calcium deficiency .

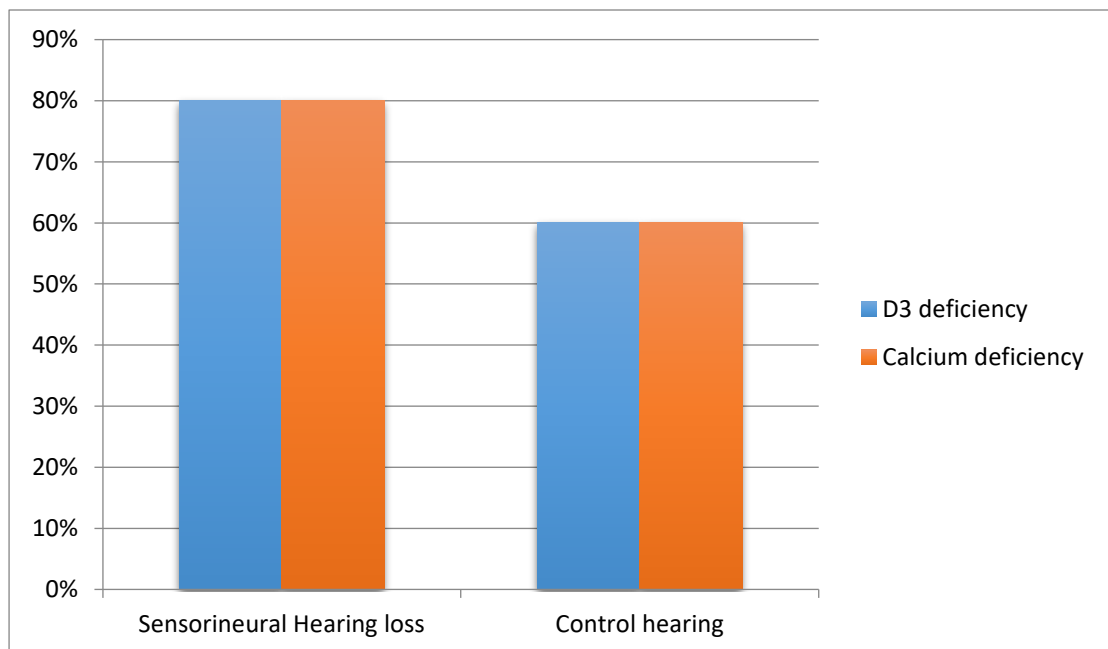


Figure 5: The comparisons between sensorineural hearing loss and control hearing with vitamin D3 deficiency and Calcium deficiency .

Discussions

This study was performed on 100 cases . 50 of them with sensorineural hearing loss and 50 with control hearing .

In present study there is correlated between vitamin D3 and Ca deficiency and sensorineural hearing loss . That there is about (80%) of cases with sensorineural hearing loss had vitamin D3 and calcium deficiency and (60%) of cases with control hearing had vitamin D3 and calcium deficiency .

Another study was conducted in Columbia University [8] find that vitamin D3 deficiency is significantly associated with bilateral hearing loss at low frequencies, that the percentage of cases with sensorineural hearing loss with D3 deficiency was (67%) and without D3 deficiency was (33%).

Also the percentage of cases with sensorineural hearing loss with calcium deficiency was (56%) and without calcium deficiency was (44%) .

In addition, according to the results was conducted in Isfahan [9] there is significant correlated between vitamin D3 and Ca level and sensorineural hearing loss .

In addition , according to the results was conducted in the American Journal of Clinical Nutrition [10] , in the elderly low vitamin D3 status was associated with low-frequency hearing loss . Low vitamin D3 status may be a potential risk factor for age related hearing loss .

Another study at Iranian Journal of Otorhinolaryngology [11] , the results showed that the serum level of vitamin D3 was lower in the case group compared to the control group .

Conclusion

According to the results of the present study, there was correlated between vitamin D3 deficiency and calcium deficiency in patients with Sensorineural Hearing loss. Cases with sensorineural hearing loss had vitamin D3 and Calcium deficiency more than cases with control hearing.

Vitamin D3 deficiency had directly and indirectly associated with sensorineural hearing loss due to demineralization of the cochlea resulting in a metabolic type of sensorineural hearing loss .

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