



Calcium and Vitamin D deficiency in Otolaryngological Diseases

Upadhyay Animesh A. and Bhide Poorva P.

Dept of Otorhinolaryngology (E.N.T), R.C.S.M government medical college and C.P.R Hospital
Correspondent Email: animeshu11@gmail.com

ABSTRACT

A prospective study to observe the prevalence of deficiency of vitamin D and Calcium in outpatients of otolaryngology clinic at R.C.S.M Government Medical College Kolhapur, India. The patients attending outpatient of otolaryngology clinic with various complaints and not responding to conventional treatment were advised for assessment of vitamin D [25 (OH) D] level in blood. To establish the presence of Calcium and Vitamin D deficiency in patients with otolaryngological diseases. The age, sex, occupation, chief complaints, obesity and provisional diagnosis was noted in all cases. A total of 86 patients were examined, maximum patients were in the age group of 7–15 years. The chief complaints in majority of the patients were sore throat with recurrent upper respiratory tract infection. Only three patient's vitamin D levels were found to be within normal limits. In the remaining 83 (96.51 %) cases it was either deficient (as in: 57 (66.28 %) or insufficient (as in 21 (24.42 %)). The incidence of vitamin D deficiency is high in Ear Nose Throat disease (E.N.T.) patients. The results of vitamin supplementation were promising in cases of Pharyngitis, URTI with asthma, post operation of Chronic Suppurative Otitis Media, empirical supplementation of vitamin D in all E.N.T. patients not responding to conventional treatment is worth trying.

INTRODUCTION

The Purpose of this study is to put some light on the relationship between Calcium, Vitamin D and ENT disorders. There is huge role of calcium in the maintenance of immunity in the body and it aids to fight off against the microbes from the environment. The role of Vitamin D in prevention of Respiratory Tract Infection or aggravating demineralization of bone is gathering evidence and hence this study was conducted to evaluate the same in the outdoor patients of Otorhinolaryngology clinic.

There is common knowledge about the spread of Middle Ear diseases and its complications. For example; a bacteria or a virus can cause pharyngitis and a chronic case will lead to its spread via the Eustachian tube towards the middle ear and form Acute Otitis Media. Now this if untreated complicates into Chronic Suppurative Otitis Media which has an association with Cholesteatoma.

There are about 200 viruses apart from Pneumococci, meningococci and streptococci, which cause common cold, pharyngitis and acute otitis media. And many of these pathogens are sensitive to antimicrobials, cathelicidin and defensin released by the body under the influence of vitamin D. [1-4]

The epithelium which faces the environment directly like the skin and the respiratory mucosa are protected by innate immunity [5]. Vitamin D has a major role in it as Toll like Receptor and Vitamin D receptor are present on the macrophages governing the innate immunity [7-9]. Vitamin D also regulates the level of the enzyme CYP27B1. All of this in turn leads to secretion of Cathelicidin, the major antimicrobial [10]. Active 1, 25 dihydroxy Vitamin D also acts as a chemotractant for Neutrophils and monocytes [11, 12]. Therefore its deficiency definitely causes decreased immunity and increased cases of Upper Respiratory tract infection. [6]

The respiratory epithelium also converts inactive Vitamin D to active 1, 25 (OH)D₃ to increase the expression of Vitamin D regulated genes[13]. It is the key immunomodulator and its deficiency will increase the incidence of URTI leading to Otitis Media retraction pockets and cholesteatoma.

There is presence of typical compensation in the body related to Vitamin D levels. When the body reserves of Vitamin D are low, the calcium gets depleted too as vitamin D fails to reabsorb calcium from the kidney and intestine. The decreased calcium activates the osteoclasts and up regulates bone resorption from dense bones first and then other small bones.

An inverse association between maternal intake of Vitamin D during pregnancy and incidence of infection, low birth weight and early childhood wheezing has been reported [15,16]. Hence, low serum vitamin D levels in the pregnant women must be considered, which may finally lead to in severe congenital hearing loss in baby.

The Calcium and Phosphorus content of woven bone of the otic capsule are much higher than other bones and hence may be more affected by deficient vitamin D and Calcium levels. Again deficiency of Vitamin D will enhance osteoclastic activity of Cholesteatoma. [14]

The role of Vitamin D deficiency has been attributed to cochlear deafness representing with trough shaped pure tone audiogram with a dip during 1 and 2 kHz frequencies.[17]

MATERIALS AND METHODS

Study Design: The design is Observational. Post treatment recovery will be observed upon when the decided treatment would be given in Placebo control and Drug Control groups.

Ethics: The procedures followed were in accordance with the Ethical Standards of Experimentation.

Sample Size: Number of subjects chosen are 86. (n=86)

Inclusion and Exclusion Criteria:

Inclusion Criteria:

The patients attending outpatient of Otolaryngology clinic:

Male and Female of Age groups 1-60+ years, with complaints of

- 1) Pharyngitis
- 2) Chronic Suppurative Otitis Media
- 3)Cholesteatoma
- 4) URTI

Exclusion Criteria:

- 1) Patients with other associated Systemic Diseases

METHODOLOGY

The patients attending outpatient of otolaryngology clinic with various complaints and not responding to conventional treatment were advised for assessment of vitamin D [25 (OH)D] level in blood. The age, sex, occupation, color of skin, chief complaints, obesity, provisional diagnosis, and incidence of sun exposure was noted in all cases. A quick general history and examination was also under taken for presence of other medical conditions.

RESULTS

A total of 86 patients in the period from 1st January to 30th May 2016 were examined. Maximum patients were in the age group of 7–15 years 40 were male 46 female as show in Table 1. Only in three patients vitamin D level was in normal limits. In rest 83 (96.51 %) it was below 25 nmol/mL 10 (11.63 %) below 25–50 nmol/mL in 57 (66.28 %) and 50–75 nmol/mL 16 (18.61 %) cases. As shown in Table 2.

TABLE 1: Age and sex distribution

Age group	No. of patients	%	Sex	
			Male	Female
1-7 year	18	20.93	10	8
7-15 years	25	29.07	14	11
15-25 years	17	19.77	7	10
25-40 years	19	22.09	8	11
40-60 years	5	5.81	1	4
60 years-onwards	2	2.33	0	2
Total	86	100	40	46

TABLE 2: Serum vitamin D level

Serum vitamin D levels	No	%
<10 nmol/mL	5	5.81
10-25	5	5.81
25-50	57	66.28
50-75	16	18.61
>75	3	3.49
>400	0	0.00
Total	86	100

Table 3: Chief Complaints

Chief complaints	No.
Sore throat	15
Sore throat with URTI	21
Atelectic ear following cholesteatoma surgery	4
Recurrent ear discharge with central perforation	17
Recurrent ear discharge with cholesteatoma	14
Sensorineural deafness	15

DISCUSSION

In our study, 96.51 % were deficient for vitamin D. Baitlay et al. in E N T patients have reported that 2 % had the level 17.5 nmol/L or less, 58 % below 50 nmol/L and all were below 80 nmol/L [18] while in our study there were 3 patients having more than 80 nmol/L vitamin D level, Rockell et al. has reported only 84 % below 80 nmol/L out of which 48 % below 50 nmol/L and 3 % below 17.5 nmol/L [19]. Ginde et al. [7] reported 2 % population below 10ng/ml and 10 % below 30 ng/ml and the incidence of URTI was 19 % while it was 24.41 % in our series.

In this study we could see that significantly lower levels were seen in upper socio economic group. No difference in status of vitamin D level as gender, race, economic status or vitamin use was considered. In this study I could not find out a case of rickets even though it was common once upon a time in India. The association of diabetes with ENT disorder was observed in 9 cases all of them were given weekly sachet of Vitamin D 60,000 units along with all other supportive treatment and reduction in weight the results were promising but it warrants specific long term study to conclude in favor of vitamin D.

There was a case of full term pregnant woman attending E.N.T outpatient department for chronic distressing cough not responding to all conventional treatment. Her vitamin D level was quite low (5.8 nmol/L) along with low serum calcium level. Patient was developing sign & symptom of preeclampsia. High doses of calcium supplementation are

attributed to prevent preeclampsia hence we propose screening for vitamin D level in all pregnant women and suitably supplemented to decrease the incidence of eclampsia.

Low serum levels of vitamin D metabolites may lead to osteoclastic activity (Osteoporosis) that is mobilization of calcium from bones may also result in secondary hyper parathyroidism. Radiologically it cannot be detected until more than 35 % demineralization of bone has been done. Demineralization of cochlea has also been observed in temporal bone tomography. We can hypothesize that osteoclastic activity will be potentially aggravated in deficiency of vitamin D. Now it is well known that deficiency of vitamin D lowers the immunity and may precipitate the recurrent attacks of upper respiratory tract infection leading to Eustachian tube dysfunction which may complicate as cholesteatoma. We have to work out the deficiency of vitamin D and blood level of calcium to prevent this drastic disorder (Cholesteatoma).

Replacement of vitamin D and calcium should be done carefully as higher calcium level may lead to extra skeletal calcification but significantly high doses has to be given for months together. Toxicity above 400 nmol/mL has been considered worth alarming. High doses of vitamin A procured from cod-liver oil can be considered as a counter active substitution.

CONCLUSION

The incidence of vitamin D deficiency is extremely common in E.N.T patients. The result of vitamin D supplementation is promising in cases of CSOM with mastoidectomy, cholesteatoma spread and URTI with asthma, since the assay of vitamin D level is costly hence repeated checkup is not cost effective.

Empirical supplementation of vitamin D in all E.N.T patients is worth trying if patient is not willing for assessment of vitamin D specifically in patients of recurrent attack of acute otitis media or other URTI.

We cannot substitute the benefit of sun exposure but certainly to enhance immunity we can supplement vitamin D. At place of sun screen, use of pomegranates and blueberries may be encouraged to prevent sunburn and tanning to prevent deficiency of vitamin D.

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