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Evaluate the Association Between Vitamin D Deficiency and Acute Otitis Media in Children at Birat Medical College and Teaching Hospital

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ABSTRACT

Introduction: Acute Otitis Media is the inflammation of the middle ear usually precipitated by an acute upper respiratory tract infection as a result of Eustachian tube dysfunction. Recent studies showed that Vitamin D might play a strong immunomodulatory role in incidence as well as severity in bacterial and viral infection showing an association of Low Vitamin D with increased risk of AOM and its recurrence and role of vitamin D supplement to prevent it.

Objectives: To compare the association of Vitamin D deficiency in patient with acute otitis media attending Birat Medical College Teaching Hospital.

Methodology: This is a hospital based comparative cross sectional study done in children aged between 1-14 years presenting in Birat Medical College Teaching Hospital from July 1st 2024 to Jan 31st, 2025. Purposive sampling was done in 80 children aged 1-14, where 40 patients with AOM was kept in group 1 and 40 children other than acute otitis media, chronic suppurative otitis media or any other ear disease were kept in group 2 . Serum vitamin D levels of all was assessed. Children's with any other systemic illness and congenital anomalies were excluded from the study.

Results: Both the groups were demographically similar in terms of age and sex distribution. The proportion of insufficient Vitamin D is significantly higher in group 1 (90%) vs. group 2 (17.5%). Also group 1 had significantly lower average vitamin D levels (18.2ng/ml) vs. control (32.6ng/ml) (p-value <0.001)

Conclusion: This study shows that low level of Vitamin D is associated with increased risk of acute otitis media and its recurrence.

Introduction

Acute Otitis Media (AOM) is the inflammation of the middle ear and is most commonly seen infection in children.[1] It is usually caused following an acute upper respiratory tract infection and is a complication of Eustachian tube dysfunction.[2] Around 29-50% of cases of upper respiratory tract infection (URTI) develop into AOM.[3] Antibiotic along with the nasal decongestants are the main treatment of AOM. As antibiotic resistance is an emerging public health challenge, more concerns should be given in proper management and to prevent recurrence so as to postpone the antibiotic therapy.

Recent studies showed that Vitamin D might play a strong immunomodulatory role in incidence as well as severity in bacterial and viral infection.[4] In any bacterial infection 25-Vitamin D is converted to 1,25 OH Vitamin D which is an active metabolite of Vitamin D by macrophages which leads to expression of genes encoding for antimicrobial peptides called Cathelicidin, a central role player in host defense against respiratory tract pathogens.[5] In addition several studies

suggested children with low vitamin D level are at higher risk to develop respiratory infectious disease followed by AOM.[6–11]

Theoretically there is an association of Low Vitamin D with increased risk of AOM and its recurrence and role of vitamin D supplement to prevent it. Thus our study intends to compare the association of Vitamin D deficiency in patient with AOM attending Birat Medical College Teaching Hospital.

Methodology

This is a hospital based comparative cross sectional study done in children aged between 1-14 years presenting in Birat Medical College Teaching Hospital (BMCTH) from July 1st 2024 to Jan 31st, 2025. Ethical clearance was obtained from Institutional Review Committee (IRC) of BMCTH (IRC – PA-372/2024). Children along with their accompanying guardians were requested to give consent for study. Purposive sampling was done where total 80 patients were included and divided into two groups. All 40 patients diagnosed as AOM, according to clinical and otoscopic findings was kept in group 1 while 40 children other than AOM, chronic suppurative otitis media or any other ear disease were kept in group 2.

Serum vitamin D levels was assessed immediately in both groups using Chemiluminiscent immunoassay (CLIA) method. Children's with any other systemic illness and congenital anomalies were excluded from the study.

Vitamin D level of <30 ng/ml, 30 to 100 ng/ml and >100 ng/ml was considered to be insufficient , sufficient and excess respectively.[12]

The collected data was recorded in specifically designed proforma, entered into Microsoft excel and statistical analysis was done using SPSS version 23, where descriptive and bivarate analyses was performed.

Results

A total of 80 patients were evaluated in this study out of which 40 patients with AOM were included in group 1 and 40 patients without AOM or any other ear disease were included in Group 2.

The mean age of patients in group 1 was 7.05±1.15 and 6.95±1.20 in group 2 with p value 0.705. There were 22 (55%) females and 18 (45%) males in group 1 while 24 (60%) females and 16 (40%) males in group 2 (p value 0.649).

Hence both the groups were demographically similar in terms of age and sex distribution. [Table 1]

Table 1: Demographic characteristics by group (mean age and sex distribution)

Group	Sample size (n)	Mean age ± SD	Males (n, %)	Females (n, %)	p- value (age)	p-value (sex)
Group 1	40	7.05 ± 1.15	18 (45%)	22(55%)	0.705	0.649
Group 2	40	6.95 ±1.20	16 (40%)	24 (60%)		

In patients with AOM most of the patients presented with earache followed by fever, running nose and cough. [Table 2]

Table 2: Presenting symptoms of the patients in AOM group (n = 40)

Symptoms	Number (%) with AOM
Earache	24 (60)
Fever	09 (22.5)
Running nose and cough	07 (17.5)

The proportion of insufficient Vitamin D is significantly higher in group 1 (90%) vs. group 2 (17.5%). Also group 1 had significantly lower average vitamin D levels (18.2ng/ml) vs. control (32.6ng/ml) [Table 3]

Table3: Vitamin D Status and average levels by groups.

Groups	Insufficient and deficient Vitamin D (n, %)	Normal Vitamin D (n, %)	Mean Vitamin D ±SD	p-value
Test Group	36(90)	4 (10)	18.2±4.1ng/ml	<0.001
Control Group	7(17.5)	33(82.5)	32.6±6.8ng/ml	

Discussion

AOM is one of the most common disease in children with frequent requirement of antimicrobial therapy.[13] It occurs usually within the first week of the upper respiratory tract infection.[14] Few studies have suggested the immunomodulatory role of vitamin D and its pivotal role in the severity and recurrence of AOM.[4]

In the present study group 1 had 22 (55%) female patients and 18(45%) male patients, while group 2 had 24(60%) female patients and 16(40%) male patients. Similar results were observed in a cross sectional study conducted by Shaheen et al, in Bangladesh where girls were relatively more affected by AOM than boys (6.6% vs 4.5%).[15] However, contrary to this, in study by Zakzouk et al there were male prevalence, though the difference was not statistically significant.[16] The reasons for sex predominance are not well known.

In our study mean age in group 1 was 7.05±1.15) while that in group 2 was 6.95±1.20 years. This might be due to most of the children in Nepal start going school after the age of 5 years and are exposed to various environmental factors and become prone to infections in their early school days. Similar results was found in study by Mandour et al.[17] However, in contrary to this, study by Pichichero stated that cases of AOM occurred in young children aged 6 to 24 months , with the incidence of AOM declining significantly after age 5 years.[18] These differences could be due to position of feeding habit in different parts of the world which may lead to Eustachian tube blockage. Various studies showed various difference in mean age as well as sex predilection. This study, even though, showed difference in mean age and gender between the two groups, it was statistically insignificant. Thus both the groups were demographically similar in terms of age

and sex distribution making the comparison more scientific.

In our study, the commonest presenting symptom was earache (60%), followed by fever (22.5%) as well as running nose and cough (17.5%) which is similar to study conducted by Saleem et al.[13] This similarities between the studies might be because of the natural course of the disease and due to similar pathogens causing AOM.

In our study, the average level of Vitamin D was 18.2±4.1 ng/ml in group 1 and 32.6±6.8 ng/ml in group 2. Comparing both the groups P value was found to be <0.0001 which was statistically significant which showed the association between insufficient vitamin D and AOM. Similar results has been shown by studies like Marchisio et al, Salem et al, Saleh Mohamed Abobaker Alshaiby.[4,13,19] Thus Vitamin D levels must be measured and addressed in patients with AOM. The immunological response and leukocyte chemotaxis are both hampered when vitamin D levels are low ultimately increasing the rate of infection as immunity is weakened.[20] According to the research it increases the production of antimicrobial peptides, defense peptides and cathelicidin peptides by natural killer cells and respiratory epithelial cells which protects from infections like AOM.[21]

The reason for low vitamin D in AOM patient, might be dependent on various factors like nutritional status of the patient, socioeconomic status, less exposure to sunlight and lack of proper hygiene and malabsorption. In contrary to our study Dahal et al, Park et al concluded that there is no relation between vitamin D deficiency and AOM.[12,22]

Conclusion

This study shows that low level of Vitamin D is associated with increased risk of AOM and its recurrence.

Recommendation

Vitamin D evaluation along with supplementation if needed is recommended for all children up to 14 years of age to reduce the incidence as well recurrence of AOM.

Limitation of the Study

Due to limited sample size, clinical judgment for AOM and lack of study in multicenter might have affected the results of our study. Several confounding variables like sunlight exposure, geographical structure, cultural values and nutritional intake might also have affected the results.

Conflict of Interest: None

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