



Relationship of Serum Vitamin D levels with Tonsillar and Adenoid Hypertrophy in Children

ARTICLE INFO

Article Type

Descriptive Study

Authors

Noei Alamdary Sh.¹ PhD,
Ghasembaglou Sh.^{1*} PhD

How to cite this article

Noei Alamdary Sh, Ghasembaglou Sh. Relationship of Serum Vitamin D levels with Tonsillar and Adenoid Hypertrophy in Children GMJ Medicine. 2023;2(4):149-152.

ABSTRACT

Aims Vitamin D has also been shown to reduce respiratory infections in children. The aim of this study was to investigate the relationship between serum vitamin D levels and tonsillar and adenoid hypertrophy in children.

Instruments & Methods This study was a retrospective cross-sectional study that was performed on 140 children with symptoms of tonsillitis referred to the hospitals of Tabriz University of Medical Sciences. All patients were divided into four groups according to the degree of tonsillitis and their severity of tonsillitis was compared with the serum level of vitamin D.

Findings Children were divided into four groups based on their grade level. There was no statistically significant difference in terms of gender between the four groups ($p=0.845$). The average level of vitamin D in children is as follows: Grade 1: Vitamin D level was 18.12 ± 2.27 ng/dL; Grade 2 had vitamin D levels of 17.48 ± 2.54 ng/dL; Grade 3 had vitamin D levels of 15.27 ± 2.03 ng/dL, and grade 4 children had vitamin D levels of 15.01 ± 2.12 ng/dL. Comparison of vitamin D levels in different groups was not statistically significant ($p=0.557$).

Conclusion There is no relationship between vitamin D levels and clinical signs and symptoms of tonsillitis in children.

Keywords Vitamin D; Tonsillitis; Children; Medical Sciences

CITATION LINKS

[1] Does adenoid hypertrophy affect disease severity in children with allergic rhinitis? [2] Basophil-derived IL-4 promotes epicutaneous antigen sensitization concomitant with the development of food allergy [3] Association of blood eosinophilia and vitamin D insufficiency in young infants with cow milk allergy [4] The differential diagnosis of basophilia in patients undergoing BCR-ABL testing [5] Can the number of eosinophils in adenoid and tonsil tissue determine the allergy in children? [6] Prevalence of adenoid hypertrophy: A systematic review and meta-analysis [7] Effects of supplemental calcium and vitamin D on tight-junction proteins and mucin-12 expression in the normal rectal mucosa of colorectal adenoma patients [8] Vitamin D receptor deletion leads to the destruction of tight and adherens junctions in lungs [9] Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data [10] Effect of High-Dose vs Standard-Dose Wintertime Vitamin D Supplementation on Viral Upper Respiratory Tract Infections in Young Healthy Children [11] SARS-CoV-2 positivity rates associated with circulating 25-hydroxyvitamin D levels [12] Vitamin D in human immunodeficiency virus infection: Influence on immunity and disease [13] Vitamin D deficiency and outcome of COVID-19 patients [14] Vitamin D and COVID-19: evidence and recommendations for supplementation [15] Serum 25-hydroxyvitamin D concentration is inversely associated with mucosal inflammation in patients with ulcerative colitis [16] Dynamics of the stool virome in very early-onset inflammatory bowel disease [17] Molecular characterization of enteric adenovirus genotypes 40 and 41 identified in children with acute gastroenteritis in Kolkata, India during 2013-2014 [18] Sodium propionate and sodium butyrate effects on histone deacetylase (HDAC) activity, histone acetylation, and inflammatory gene expression in bovine mammary epithelial cells [19] Bacteroides, butyric acid and t10,c12-CLA changes in colorectal adenomatous polyp patients [20] Adenovirus: Epidemiology, global spread of novel serotypes, and advances in treatment and prevention

¹Department of Otorhinolaryngology, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

*Correspondence

Address: Department of Otorhinolaryngology, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Phone: -

Fax: -

shahramgasembaglou@yahoo.com

Article History

Received: April 22, 2023

Accepted: September 10, 2023

ePublished: October 26, 2023

Introduction

The throat can become inflamed for a variety of reasons. One of the main causes of sore throat is infections. Infection is initially the result of an underlying disease. But sometimes some causes are associated with the baby from birth and cause sore throat. Tonsil hypertrophy means an unusual enlargement of the tonsils that may be present at birth or caused by an infection [1].

Tonsil hypertrophy is a term used for the unexpected enlargement of tonsil tissue. In severe cases, tonsillar hypertrophy can interfere with swallowing and breathing. To treat this condition, your doctor will usually prescribe surgery to remove excess tissue [2].

Inflammatory and infectious diseases of the throat, tonsils and adenoids account for a major share of pediatric diseases and their health care costs [3]. In most cases, these diseases lead to two common pediatric surgeries, tonsillectomy and adenoidectomy [4]. The tonsils and adenoids are part of the Waldeyer's ring whose main function is to produce antibodies. Although many factors contribute to pharyngotonsillitis, the underlying cause is unclear. Causes such as environmental status, the state of the child's immune system and the influence of bacteria on the occurrence of infectious reactions in the tonsil mucosa are known to be important. Various studies have examined the effect of vitamin D on the body's immunity [5]. Decreased immunity leads to more infections such as tonsillitis, and multiple attacks of inflammation and infection can lead to tonsillar hypertrophy [6]. Which is an important factor in sleep-disordered breathing [7]. Vitamin D has also been shown to reduce respiratory infections in children.

The aim of this study was to investigate the relationship between serum vitamin D levels and tonsillar and adenoid hypertrophy in children referred to the clinics of Tabriz University of Medical Sciences.

Instrument and Methods

Study design

This retrospective cross-sectional study was conducted from the beginning of 2019 to the end of 2019 with the participation of children aged 3 to 15 years who referred to the ENT clinics of Tabriz University of Medical Sciences. Since the sampling method was census, all clients were examined according to the entry/exit criteria. So in the end, 140 children were examined.

Inclusion/Exclusion Criteria

Inclusion criteria were age between 3 to 15 years, signs of tonsillitis and parental consent to participate in the research project. Exclusion criteria were patients with immunodeficiency, children with underlying diseases such as diabetes and rickets, vitamin D intake in the daily diet.

Methods: Individual data of children included in the study were recorded, such as age and sex. They were examined by the author of the article by inserting an abscess into the anterior two-thirds of the tongue. The size of the palate tonsils was assessed in the absence of gag reflex and was recorded as follows: Grade 1: The tonsils cover up to 25% of the airway. Grade 2: The tonsils cover 25% to half of the airway. Grade 3: The tonsils cover 50 to 75% of the airway. Grade 4: Airway obstruction 75 to 100%. For ethical reasons, plain X-rays were requested for adenoid examination only in suspected cases and not in all patients. Suspicious cases were defined as follows: observation of obstructive symptoms, grade 3 or 4 and the presence of symptoms of tonsillitis. Adenoid X-ray was performed in the lateral view in the case of hyperextension, and if more than 75% of the airway was filled with adenoid tissue, it was considered hypertrophy. Vitamin D levels less than 10ng/dl were severely deficient, vitamin D levels between 10 and 20ng/dl were considered mild deficiencies, and vitamin D levels above 20ng/dl were considered normal. In terms of age, patients were divided into three groups: 3 to 5 years, 6 to 10 and over 10 years. Then blood samples were taken from patients to assess serum levels of vitamin D by immunoassay. Vitamin D was measured using a 25-OH Vitamin D ELISA kit by competitive immunological assay.

Data analysis

The collected data were entered into SPSS 20 software; Independent t-test was used to compare quantitative variables in two groups, ANOVA test was used in more than two groups and Chi-square test was used in qualitative variables.

Ethical considerations

Informed consent was obtained from the children's parents. The objectives of the study were explained to the parents and participants were not charged for testing for vitamin D levels. Participation in this study was also completely optional.

Findings

140 children were studied whose age ranged from 3 to 15 years and their mean age was 7.29 ± 2.66 years. 69 children were girls and 71 were boys. Vitamin D levels ranged from 5.5 to 32ng/dL and the mean serum level in all participants was 15.75 ± 3.95 .

Patients were divided into three age groups: 5 years and younger (49 patients), 6 to 10 years old (53 patients) and over 10 years old (38 patients). The mean level of vitamin D in different groups was not statistically significant ($p=0.175$). In girls, the mean level of vitamin D was 16.95 ± 3.72 ng/dl and in boys was 16.05 ± 3.45 ng/dl, there was no difference between the two groups in terms of vitamin D levels ($p=0.257$).

Only 29 patients had vitamin D levels above 20ng/dL, 98 patients had vitamin D levels between

10 and 20ng/dL, and 13 patients had vitamin D levels below 10ng/dL. Children were divided into four groups based on their grade level. There was no statistically significant difference in terms of gender between the four groups ($p=0.845$). The average level of vitamin D in children is as follows: Grade 1: Vitamin D level was 18.12 ± 2.27 ; Grade 2 had vitamin D levels of 17.48 ± 2.54 ng/dL; Grade 3 had vitamin D levels of 15.27 ± 2.03 ng/dl, and grade 4 children had vitamin D levels of 15.01 ± 2.12 . Comparison of vitamin D levels in different groups was not statistically significant ($p=0.557$).

02 patients were eligible for adenoid imaging. Adenoid hypertrophy was observed in 30 of them; There was no significant difference in the rate of adenoid hypertrophy in groups of children with different grades of tonsils ($p=0.673$). In children with adenoid hypertrophy, the mean level of vitamin D was 15.77 ± 2.54 ng/dL and in others it was 14.95 ± 2.75 ng/dL, which were statistically significant ($p=0.491$).

Discussion

Although tonsils help fight infections when they are healthy, they can sometimes cause more problems than they can. This problem occurs when the tonsils become inflamed and infected. If you look inside your baby with a flashlight, the tonsils may be red and inflamed or have a white or yellow surface. Symptoms of tonsillitis include sore throat, pain and discomfort when swallowing food, fever, inflammation of the lymph nodes in the neck, headache, cold sensation, voice changes, and sore throat that is mistaken for earache; Of course, large, swollen tonsils are a common occurrence among many children and can last for years, and you, as the child's parents, should not judge too quickly [8-10]. If you suspect an infection, consult your doctor [11]. How long should the tonsils be removed? The doctor may notice a removal of the tonsils if one or more of the symptoms appear: persistent tonsillitis or a microbial sore throat, inflamed tonsils that make it difficult to breathe, and difficulty eating meat and chewable foods [12].

According to the results of the present study, vitamin D levels in children with grade 3 and 4 were lower than in children with grade 1 and 2, but no significant relationship was found between tonsil size and vitamin D levels. There was also no significant relationship between adenoid hypertrophy and vitamin D levels. In a study of 110 patients undergoing tonsillectomy and measuring their serum vitamin D levels, low vitamin D levels were significantly associated with utopia and allergic rhinitis, but serum vitamin D levels were not associated with indications for patients' tonsillectomy. Given that one of the most common indications for tonsillectomy is an increase in size and obstructive symptoms, it can be said that the

results of this study are consistent with the current study, although the size of the tonsils has not been directly studied [13-16].

A study was performed on 67 children with obstructive sleep apnea and 70 healthy children. They divided the children into 4 groups based on the size of the tonsils and adenoids. Serum levels of vitamin D were determined [17]. There was a significant association between sleep-disordered breathing and vitamin deficiency. The difference between this article and the present study is that patients with sleep-disordered breathing typically have larger tonsils and adenoids, and this may explain the difference in results [18].

One study compared 88 children treated for obstructive respiratory problems with control serum vitamin D levels. Like our study, they divided the tonsils into four grades based on size, and assumed that the adenoids, which occupied more than 80 percent of the nasopharynx, were hypertrophic. Although the method was very similar to the present study, the result was completely different. They found a significant association between the presence of tonsillar hypertrophy, adenoids, or both with low serum vitamin D levels. On the other hand, the prevalence of tonsillar and adenoid hypertrophy was significantly higher in children with vitamin D deficiency. This difference may be due to differences in the sample size of the two studies [19, 20].

The small sample size is one of the limitations of this study. This study only examined the size of the tonsils and in previous studies, an association was found between infectious and inflammatory diseases and obstructive sleep disorders and vitamin D levels, and the size of the tonsils and adenoids were not considered. Lack of control group is another limitation of this study, so it is recommended that patients who are candidates for adenotonsillectomy be compared with other children for vitamin D levels.

Conclusion

There is no relationship between vitamin D levels and clinical signs and symptoms of tonsillitis in children.

Acknowledgements: None declared by the authors.

Ethical Permission: This study was approved by the Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1397.057).

Conflicts of Interests: None declared by the authors.

Funding/Support: None declared by the authors.

References

- 1- Dogru M, Evcimik MF, Calim OF. Does adenoid hypertrophy affect disease severity in children with allergic rhinitis?. *Eur Arch Otorhinolaryngol.* 2017;274:209-13.

- 2- Hussain M, Borcard L, Walsh KP, Pena Rodriguez M, Mueller C, Kim BS, et al. Basophil-derived IL-4 promotes epicutaneous antigen sensitization concomitant with the development of food allergy. *J Allergy Clin Immunol*. 2018;141(1):223-234.e5.
- 3- Li J, Mei X, Cai X, Zhuo Y, Zhang L, Guo H, et al. Association of blood eosinophilia and vitamin D insufficiency in young infants with cow milk allergy. *Asia Pac J Clin Nutr*. 2019;28(3):550-7.
- 4- Smith CJ, Kluck LA, Ruan GJ, Ashrani AA, Hook CC, Marshall AL. The differential diagnosis of basophilia in patients undergoing BCR-ABL testing. *Am J Hematol*. 2020;95(9):E216-E217.
- 5- Ekici NY, Görgülü O, Yucel G, Külahci O, Arikan OK, Durmaz C. Can the number of eosinophils in adenoid and tonsil tissue determine the allergy in children?. *Int J Pediatr Otorhinolaryngol*. 2018;108:35-9.
- 6- Pereira L, Monyror J, Almeida FT, Almeida FR, Guerra E, Flores-Mir C, et al. Prevalence of adenoid hypertrophy: A systematic review and meta-analysis. *Sleep Med Rev*. 2018;38:101-12.
- 7- Mandle HB, Jahan FA, Bostick RM, Baron JA, Barry EL, Yacoub R, et al. Effects of supplemental calcium and vitamin D on tight-junction proteins and mucin-12 expression in the normal rectal mucosa of colorectal adenoma patients. *Mol Carcinogen*. 2019;58(7):1279-90.
- 8- Chen H, Lu R, Zhang YG, Sun J. Vitamin D receptor deletion leads to the destruction of tight and adherens junctions in lungs. *Tissue Barriers*. 2018;6(4):1-13.
- 9- Martineau AR, Jolliffe DA, Hooper RL, Greenberg L, Aloia JF, Bergman P, et al. Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data. *BMJ*. 2017;356:i6583.
- 10- Aglipay M, Birken CS, Parkin PC, Loeb MB, Thorpe K, Chen Y, et al. Effect of high-dose vs standard-dose wintertime vitamin D supplementation on viral upper respiratory tract infections in young healthy children. *JAMA*. 2017;318:245-54.
- 11- Kaufman HW, Niles JK, Kroll MH, Bi C, Holick HF. SARS-CoV-2 positivity rates associated with circulating 25-hydroxyvitamin D levels. *PLoS One*. 2020;15:e0239252.
- 12- Jimenez-Sousa MA, Martinez I, Medrano LM, Fernandez-Rodriguez A, Resino S. Vitamin D in human immunodeficiency virus infection: Influence on immunity and disease. *Front Immunol*. 2018;9:458.
- 13- Radujkovic A, Hippchen T, Tiwari-Heckler S, Dreher S, Boxberger M, Merle U. Vitamin D deficiency and outcome of COVID-19 patients. *Nutrients*. 2020;12(9):2757.
- 14- Griffin G, Hewison M, Hopkin J, Kenny R, Quinton R, Rhodes J, et al. Vitamin D and COVID-19: evidence and recommendations for supplementation. *R Soc Open Sci*. 2020;7(12):201912.
- 15- Meckel K, Li YC, Lim J, Kocherginsky M, Weber C, Almoghrabi A, et al. Serum 25-hydroxyvitamin D concentration is inversely associated with mucosal inflammation in patients with ulcerative colitis. *Am J Clin Nutr*. 2016;104(1):113-20.
- 16- Liang G, Conrad MA, Kelsen JR, Kessler LR, Breton J, Albenberg LG, et al. Dynamics of the stool virome in very early-onset inflammatory bowel disease. *J Crohns Colitis*. 2020;14(11):1600-10.
- 17- Banerjee A, De P, Manna B, Chawla-Sarkar M. Molecular characterization of enteric adenovirus genotypes 40 and 41 identified in children with acute gastroenteritis in Kolkata, India during 2013-2014. *J Med Virol*. 2017;89(4):606-14.
- 18- Silva LG, Ferguson BS, Avila AS, Faciola AP. Sodium propionate and sodium butyrate effects on histone deacetylase (HDAC) activity, histone acetylation, and inflammatory gene expression in bovine mammary epithelial cells. *J Anim Sci*. 2018;96(12):5244-52.
- 19- Chen C, Niu M, Pan J, Du N, Liu S, Li H, et al. Bacteroides, butyric acid and t10,c12-CLA changes in colorectal adenomatous polyp patients. *Gut Pathog*. 2021;13(1):1.
- 20- Lynch III JP, Kajon AE. Adenovirus: Epidemiology, global spread of novel serotypes, and advances in treatment and prevention. *Semin Respir Crit Care Med*. 2016;37(4):586-602.