

# Effect of Breastfeeding and Serum Zinc Levels on Childhood Recurrent Tonsillopharyngitis

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**Abstract:** *Aim:* To evaluate serum zinc levels and breast milk intake in pediatric patients with recurrent tonsillopharyngitis

*Material Method:* 40 pediatric patients who were admitted to our polyclinics with the diagnosis of tonsillopharyngitis diagnosed as  $\geq 7$  times a year were included in Group 1; 40 healthy children who applied to the outpatient clinic for routine control in the same period were defined as Group 2. Serum zinc, blood parameters, C-reactive protein (CRP) values were studied from all patients. Patient complaints, breastfeeding time, and family history were questioned.

*Results:* There was no significant difference between the groups in terms of Hemaoglobin(Hb), hematocrit(Hct), white blood cell count(WBC), platelet count(Plt), mean platelet volume(MPV) and CRP values were significantly higher in the patient group ( $p=0.001$ ). Serum zinc levels were significantly lower in Group 1 than Group 2 ( $p=0.000$ ;  $p < 0.05$ ). There was no significant difference between the groups regarding the duration of breastfeeding ( $p=0.086$ ;  $p > 0.05$ ).

*Conclusion:* Our study showed that zinc deficiency may play a role in the etiopathogenesis of recurrent tonsillopharyngitis. Zinc supplementation may be recommended for children with recurrent tonsillopharyngitis. There is a need for further studies to be done in larger population related to zinc levels in mother's milk content, serum zinc levels in mothers and zinc deficiency.

**Keywords:** Recurrent tonsillopharyngitis, zinc, breast milk, child, tonsillitis.

## INTRODUCTION

Chronic and recurrent tonsillopharyngitis is defined as 7 and more in 1 year or 5 or more per year for 2 consecutive years or as being 3 or more per year for 3 consecutive years [1] and is one of the most common infectious diseases in childhood. It is an important health problem for patients due to apply to hospitals many times, cause irrational use of antibiotics and result in tonsillectomy by disrupting the quality of life of the patient [2]. Although these patients have been treated in outpatient clinics many times a year, they may be hospitalized several times until the decision of tonsillectomy. Complaints may persist even after a tonsillectomy [3]. If tonsillitis attacks are due to group A beta hemolytic streptococci(GABS) complications such as acute rheumatic fever and acute poststreptococcal glomerulonephritis are also encountered [4]. The pathogenesis of chronic and recurrent tonsillopharyngitis remains unclear [5].

The role and importance of zinc in the immune system has been investigated for many years.

Studies have shown that zinc deficiency is associated with chronic inflammatory diseases, delay in wound healing, dermatitis, alopecia, and some

opportunistic pathogens that are expected to be seen in immunodeficiency [6]. When there is zinc deficiency, is known to be more severe infections that are likely to be mild. If there is zinc deficiency, it is known that some mild illnesses can be more severe and it is known that zinc supplementation, especially in developing countries, protects against diseases such as diarrhea, pneumonia, malaria, and decreases mortality and morbidity [7]. Malnutrition is one of the most important causes of zinc deficiency. Breast milk intake is very important in areas where malnutrition is endemic. Protective effects of breast milk from infections on both short and long term are also known. Although the zinc content of breast milk is related to the mother's diet, it is accepted that the first 3 months of life are adequate for baby[8,9].

The aim of our study was to evaluate serum zinc levels and the effect of breastfeeding duration on children who were followed up with the diagnosis of recurrent tonsillopharyngitis.

## MATERIAL AND METHODS

The study was designed prospective cross sectional and conducted between November 2018 and March 2019. Ethics committee approval was obtained for the study (31.10.2018 / 80576354-05-099 / 174) and written informed consent was obtained from the patients. 40 pediatric patients who were admitted to our outpatient clinic with the diagnosis of tonsillopharyngitis

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diagnosed as  $\geq 7$  times a year were included in Group 1; 40 healthy children who applied to the outpatient clinic for routine control in the same period were defined as Group 2. Serum zinc, some whole blood parameters (hemoglobin, hematocrit, white blood cell count, mean platelet volume, platelet count), C-reactive protein (CRP) values were studied in all patients. Serum zinc levels were studied by atomic absorption spectrometry method. Whole blood parameters were studied with ABX Pentra DX120-Horiba hematology meter. CRP values were measured by ELISA.

Patient complaints, breastfeeding duration and family history were questioned.

Patients with any chronic systemic disease, diagnosed as immunodeficiency, having syndromic symptoms, having an allergic disease, having a percentile value outside the normal range (malnutrition, obesity, short stature, etc.) and using any zinc-containing medical product within the last 3 months were not included in the study.

SPSS 21 (Statistical Package of the Social Sciences, USA) program was used for data analyses. Kolmogorov-Smirnow test was used for distribution; Chi-square, Student T test, OneWay Anova and Man Whitney U tests were performed for comparisons between groups.

## RESULTS

The mean age for all groups was  $5.80 \pm 3.67$  years. There was no statistically significant difference between the ages and genders of Group 1 and Group 2 ( $p=0.250$ ;  $p=0.292$   $p > 0.05$ ; Table 1). In our patients, fever with 85% was the highest rate, disability in oral intake was 82.5%, the crypt presence was 70%, the need for antibiotics to use for more than 6 times per year was 72.5%. The rate of AGBS was 60% in the throat culture of the patients and this rate was 85% when the previous follow-up was included. The rate of recurrent tonsillopharyngitis in first-degree relatives of patients was 77.5% (Table 2). For Group 1 mean values of hemoglobine (Hb) was  $13.14 \pm 1.07$  g / dL, hematocrit (Hct) was  $39.61 \pm 2.87\%$ , white blood cell count (WBC) was  $9250 \pm 3461 / \text{mm}^3$ , platelet count (Plt) was  $319850 \pm 86923 / \text{mm}^3$ , mean platelet volume (MPV) was  $7.81 \pm 0.64$  fL, CRP was  $2.28 \pm 4.2$  mg / dL, serum zinc (Zn) was  $73.14 \pm 9.66$   $\mu\text{g} / \text{dL}$  while for Group 2 these rates were Hb  $12.85 \pm 1.56$  g / dL, Hct  $38.85 \pm 3.97\%$ , WBC  $8875 \pm 2622 / \text{mm}^3$ , Plt  $334025 \pm 90925 / \text{mm}^3$ , MPV  $7.90 \pm 0.65$  fL, CRP was  $0.062 \pm$

$0.12$  mg / dL, Zn  $86.51 \pm 11.68$   $\mu\text{g} / \text{dL}$ . There was no significant difference between groups in terms of Hb, Hct, WBC, Platelet, MPV values. But CRP values were significantly higher in the patient group ( $p = 0.001$ ; Table 3). Serum zinc levels were significantly lower in Group 1 than Group 2 ( $p = 0.000$ ;  $p < 0.05$ ; Figure 1). There was no significant difference between the groups regarding the duration of breastfeeding ( $p = 0.086$ ;  $p > 0.05$ ).

**Table 1: Evaluation of Group 1 and Group 2 by Gender and Age**

	Group 1	Group 2	P
Female	20 (%45,5)	24 (%54,5)	0,250
Male	20 (%55,6)	16 (%44,4)	
Age (years)	5,93 $\pm$ 3,285	5,68 $\pm$ 4,072	0,292

Chi-Square test.

**Table 2: Clinical Features of Group 1**

	%
Fever	85
Disability of oral intake	82,5
Sore Throat	72,5
Presence of crypts	70
Lymphadeopathy	57,5
Oral aphtous stomatitis	32,5
Antibiotic use for more than six times a year	72,5
GABS culture (+) (at the moment/ included previous culture results)*	60/85
Familial story**	77,5

\*GABS: Group A beta hemolytic streptococcus.

\*\*Familial story: History of recurrent tonsillopharyngitis or tonsillectomy in first degree relative of the patient.

## DISCUSSION

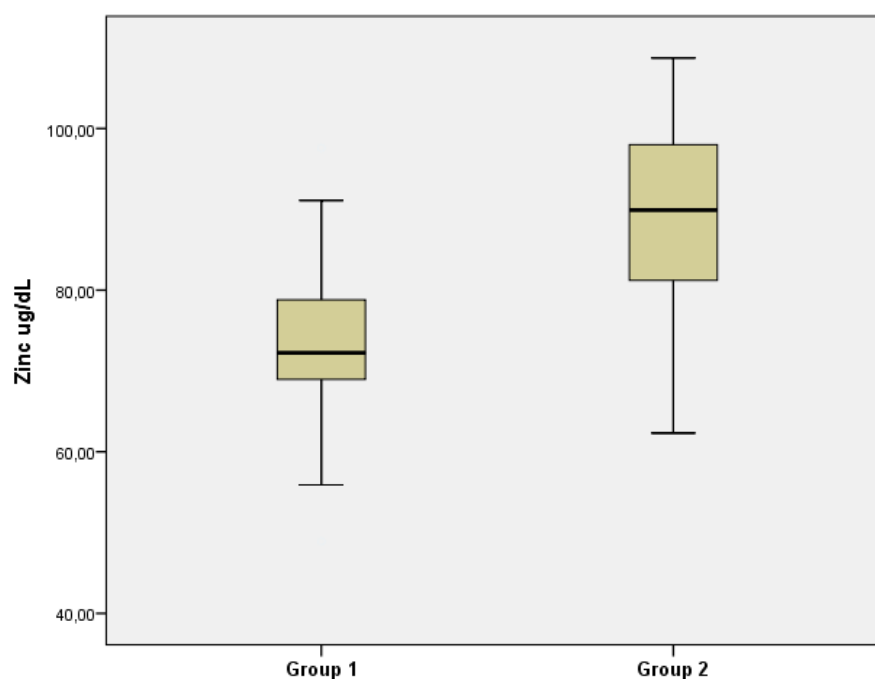
In the etiopathogenesis of recurrent tonsillopharyngitis, immune dysfunction, inadequate and inappropriate antibiotic use, bacterial load, biofilm layer formed by microorganisms, genetic factors are blamed [10]. However, since pathogenesis cannot be fully elucidated, it is not a cost-effective treatment for patients until diagnosis and tonsillectomy are performed [11].

The most common signs were fever and disability oral intake in our patients, and the rate of antibiotic use more than 6 times per year was very high. In a similar study in Israel, fever was found to be the most common

**Table 3: Evaluation of Blood Count Parameters, Serum Zinc Level, and Breastfeeding Duration of Group 1 and Group 2**

	Group 1	Group 2	<i>p</i>
Hb (g/dL)	13,14±1,07	12,85±1,56	0,332
Hct (%)	39,61±2,87	38,85±3,97	0,327
WBC (/mm <sup>3</sup> )	9250±3461	8875±2622	0,587
Platelet (/mm <sup>3</sup> )	319850±86923	334025±90925	0,478
MPV (fL)	7,81±0,64	7,90±0,65	0,535
CRP (mg/dL)	2,28±4,2	0,062±0,12	0,001
Zinc (µg/dL)	73,14±9,66	86,51±11,68	0,000
Braestfeeding duration (month)	14,50±5,76	16,85±6,32	0,086

Independent Student T test-One Way Anova.

**Figure 1:** Evaluation of serum zinc levels.

clinical finding, with a negative correlation between duration of using antibiotics and complications of illness [12]. On the other hand, the side effects of antibiotic treatment and the need for hospitalization negatively affect the quality of life of patients. Recurrent tonsillopharyngitis in the first degree relatives of our patients was higher than 75%. This made us think of the underlying genetic factors. Recurrent tonsillopharyngitis due to GABS has been associated with the biofilm layer produced by bacteria in patients with genetic predisposition [13]. Asymptomatic GABS carriers in the community are also a source of transmission for these patients [14]. When we look at the throat cultures of our patients in the last year, we found that AGBS reproduction rate was 85%. This

situation made us primarily think of antibiotic resistance problem with the formation of biofilm layer in tonsils.

In recent years, in children with recurrent tonsillitis, after tonsillectomy, the risk of chronic and immune system-related diseases increased, and after the operation, recurrence of episodes started to seek new treatments [15,16]. Therefore, the investigation of biofilm layer and immunogenetic mechanisms has become more important.

The relationship between zinc and immunological functions, infection and inflammation is investigated for a long time. Zinc is an element that plays an important role in basic physiological functions in the body,

especially in the elimination of pathogenic microorganisms through both cellular and humoral systems. Zinc deficiency is known to decrease T lymphocytes, B lymphocytes and Naturel Killer cells and consequently increase the severity of infections. It is also known that cytokines (IL-1, IL-6, TNF alpha) which exacerbate inflammation increase and therefore the host tissue is damaged [17,18]. In a meta-analysis performed in China, it was noted that children with recurrent lower respiratory tract infections had significantly lower Zn levels in hair [19]. In another study in Yemen, serum Zn levels were found to be significantly lower in children with chronic suppurative otitis[20]. In another study conducted in Poland, there was no significant difference between serum zinc levels of children with recurrent aphthous stomatitis and control group. However, the author noted that the study was limited in terms of age, gender, and time; but that zinc supplementation might be required for these patients [21]. In a study by Prasad et al., serum Zn levels were found to be low in children with acute lower respiratory tract infections but not with the severity of the disease [22]. Michalska-Mosiej et al. found serum Zn levels were significantly lower in patients with chronic tonsillitis in adults [23]. In our country, in the study of Önerci et al. serum Zn levels were found to be low in children with recurrent tonsillitis [24], but in the study of Demirci et al. serum Zn level was not significant in the patient group, although there was low[25]. In the study of Somuk et al., serum Zn levels are lower in children with recurrent tonsillitis than in patients with tonsillar hypertrophy [26].

In our study, we found that serum Zn levels were lower in children with recurrent tonsillitis compared to the control group. These children suggested that zinc supplementation may be given in the follow-up.

In our study, CRP value which is a positive acute phase reactant was significantly higher in the patient group, but we did not find any significance in blood parameters (WBC, Plt, MPV, Hb, Hct). There are similar results in our studies for CRP, Hb, Hct, Plt, MPV [27,28]. However, in many studies, WBC values were higher in the patient group [29,30]. In the study of Cengiz et al. found no significant difference in WBC count and a significant difference in Plt and MPV values in patients with chronic tonsillitis [31]. In our study, WBC values were high in the patient group but statistical significance was not obtained. Different results can be obtained in new studies with a larger number of patient groups.

It is known that breast milk is more than a nutrient; it is the first vaccine, the first probiotic and the first antibacterial [32]. In addition to this, the protectiveness of exclusively breastfeeding and breastfeeding duration against chronic diseases and frequent infections in the long term has been investigated in recent years [33]. In Li et al.'s study that investigated the relationship between breastfeeding duration and frequency of infection in 6-year-old children, they found the duration of breastfeeding was associated with a lower incidence of ear, throat and sinus infections [34]. Lack of breastfeeding accepted as a risk factor especially for recurrent respiratory infections[35]. Haifeng et al. investigated the risk factors of recurrent respiratory infections in pre-school children, they found similar to our study, breast milk duration could not obtain statistical significance in the resident population and serum Zn levels were found to be significantly lower [36]. In the same study, they found that breastfeeding was effective in floating population.

#### **LIMITATION**

We could not achieve statistical significance in breastfeeding duration although we found high levels of breast milk intake in patients with recurrent tonsillopharyngitis. It was the limitation of our work that it is not a prospective cohort study and we accept breast milk intake times in a way that they remember based on mothers' conversation.

#### **CONCLUSION**

We evaluated breast milk and serum zinc levels independently and separately for their effect on recurrent tonsillopharyngitis and our study showed that zinc deficiency may play a role in the etiopathogenesis of recurrent tonsillopharyngitis.

Based on this, zinc supplementation may be recommended for children with recurrent tonsillopharyngitis. Breast milk intake was found to be insignificant among the groups. There is a need for further studies to be done in larger groups of breast milk contents including zinc levels, serum zinc levels, breast milk intake and zinc deficiency.

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## DECLARATION OF INTEREST

None.

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