

# New diagnostic indicators in chronic otitis media with effusion: neutrophil to lymphocyte ratio and thrombocyte lymphocyte ratio

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## Abstract

**Objective:** Inflammation has an important place in chronic otitis media with effusion (COME) etiology. Neutrophil to lymphocyte ratio (NLR) and platelet to lymphocyte ratio (PLR) are simple and cheap tests that show inflammation and can be calculated by all physicians. In our study, we aimed to investigate the relationship between COME and NLR and PLR parameters.

**Methods:** The study was performed with the pediatric patient group consisting of 77 patients who got diagnosis of COME and the control group consisting of 62 healthy children whose age, gender and demographical characteristics were concordant with the patient group. The patient and control groups were compared statistically in terms of NLR and PLR values.

**Results:** Mean neutrophil to lymphocyte ratio value was found as  $1.43 \pm 0.54$  in the patient group and as  $1.16 \pm 0.51$  in the control group ( $p < 0.001$ ). Mean PLR value was found as  $113.78 \pm 35.78$  in the patient group and as  $103.61 \pm 32.32$  in the control group ( $p = 0.084$ ).

**Conclusion:** Neutrophil to lymphocyte ratio and PLR values were high in COME. It was shown for the first time that NLR can be used as a diagnostic parameter in children with COME.

**Keywords:** Serous otitis media, inflammation, neutrophil, lymphocyte, thrombocyte.

## Özet: Kronik effüzyonlu otit tanısında yeni tanısal belirteçler: Nötrofil lenfosit oranı ve trombosit lenfosit oranı

**Amaç:** Enflamasyon, kronik effüzyonlu otit (KEOM) etyolojisinde önemli bir yere sahiptir. *Neutrophil to lymphocyte ratio* (NLR) ve *platelet to lymphocyte ratio* (PLR) enflamasyonu gösteren ve bütün hekimlerin hesaplayabileceği basit, ucuz testlerdir. Bu çalışmada KEOM ile NLR ve PLR değerleri arasındaki ilişkiyi ortaya koymayı amaçladık.

**Yöntem:** Çalışma KEOM tanısı konmuş olan 77 hastadan oluşan çocuk hasta grubu ile yaş, cinsiyet ve demografik özellikleri hasta grubu ile uyumlu 62 sağlıklı çocuktan oluşan kontrol grubu ile yapıldı. Hasta ve kontrol grubu, NLR ve PLR değerleri açısından istatistiksel olarak karşılaştırıldı.

**Bulgular:** Hasta grubunda NLR değeri ortalaması  $1.43 \pm 0.54$ , kontrol grubunda NLR ortalama değeri  $1.16 \pm 0.51$  olarak bulundu ( $p < 0.001$ ). PLR değeri ortalaması hasta grubunda  $113.78 \pm 35.78$ , kontrol grubunda  $103.61 \pm 32.32$  olarak saptandı ( $p = 0.084$ ).

**Sonuç:** Kronik effüzyonlu otitte NLR ve PLR değerleri yüksek bulunmuştur. KEOM tanısı olan çocuklarda NLR'nin tanıma yardımcı parametre olarak kullanılabilirliği literatürde ilk kez gösterilmiştir.

**Anahtar sözcükler:** Seröz otitis media, enflamasyon, nötrofil, lenfosit, trombosit.

Otitis media with effusion (OME) is the liquid in the middle ear cavity without having findings of inflammation or infection. OME is one of the most frequent hearing losses in childhood period. Thus, it affects language and cognitive development of the children in case it is not treated.<sup>[1]</sup>

OME continues more than three months in some cases despite of medical treatment and called chronic otitis media with effusion (COME). Adhesive otitis media, chronic otitis media and cholesteatoma may develop in time depending on COME.<sup>[2]</sup> Thus, the follow up of the

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patient should not be prolonged; a ventilation tube should be installed.

Complete blood count (CBC) analysis was made in blood sample that was taken from peripheral vein in order to determine neutrophil to lymphocyte ratio (NLR) and also platelet to lymphocyte ratio (PLR). PLR was found to be high in several peripheral vascular diseases, coronary artery diseases and some gynecological and hepatobiliary malignities and was associated with poor prognosis. NLR may increase in systemic inflammation, some gynecological and gastrointestinal cancers and some cardiovascular diseases.<sup>[3,4]</sup>

It was shown in the study performed by Somuk et al.<sup>[5]</sup> that mean platelet volume (MPV) parameter could be used as an auxiliary parameter in diagnosing in the children with COME. In our study, the research was to diagnose children with COME.

## Materials and Methods

### Patients and subject

Ventilation tube was applied to seventy-seven patients with COME between January 2013 and June 2014. The control group consisted of 62 healthy children that are similar with the patient group in terms of age, gender and demographic characteristics.

In patient group, children who were determined to have otitis media with effusion via otoscopic examination, conductive hearing loss in audiological evaluation and type B tympanogram were included.

The patients who were under six years old were followed via anti-inflammatory treatment and short time (three days) topical decongestant treatment. The patients who were over six years old were followed via anti-inflammatory treatment and systemic decongestant treatment quarterly. Ventilation tube was applied to the patients who could not respond to the treatment and continued to have otitis media with effusion in otoscopic treatment and audiological evaluation at the end of three months.

Hemogram analysis was made in blood sample that was taken from the peripheral vein. In the patient and control group, children who with chronic adenotonsillar disease, chronic inflammatory disease, active upper respiratory tract infection, asthma, allergic rhinitis, chronic cardiac disease, chronic pulmonary disease, chronic kidney disease, immune disorder, metabolic disease and cystic fibrosis were excluded from the study.

Complete blood count was determined (Sysmex WE-2100; Sysmex, Mundelein, IL, USA) and based on mean platelet volume (MPV), erythrocyte, leukocyte, neu-

trophil, lymphocyte and thrombocyte counts were used to determine PLR and NLR. NLR value was calculated by dividing neutrophil number into lymphocyte number and PLR value was calculated by dividing thrombocyte number into the lymphocyte number. Leukocyte, neutrophil, lymphocyte, thrombocyte, MPV, NLR and PLR values of the patient and control group were compared to each other statistically.

### Statistical analysis

Descriptive statistics were presented as mean  $\pm$  standard deviation, and the categorical variables were presented as the number of the cases and %. The comparison of the difference for age, gender and complete blood count parameters between patient and control group was tested using t-test.  $P < 0.05$  value was considered significant. Statistical Package Program for Social Sciences (SPSS) for Windows, version 21.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analyses.

## Results

While there were 47 male and 30 female children in the patient group, there were 34 male and 28 female children in the control group. While the mean age of the patient group was  $7.06 \pm 2.67$  (range: 3 to 15), the mean age of the control group was found as  $7.77 \pm 2.84$  (range: 4 to 15). It was determined in the statistical evaluation that patient and control group were similar with each other in terms of age and gender (Table 1).

Mean neutrophil value in the patient group was found as  $4.17 \pm 1.37$  and it was found as  $3.55 \pm 1.50$  in the control group ( $p=0.012$ ). Neutrophil number in the patient group was significantly and statistically higher than the control group.

Mean leukocyte value in the patient group was found as  $8.06 \pm 2.03$  and this value was found as  $7.68 \pm 2.12$  in the control group ( $p=0.283$ ). While mean thrombocyte value was  $323.75 \pm 59.46$  in the patient group, it was found as  $312.54 \pm 57.35$  in the control group ( $p=0.264$ ). While mean MPV value was  $9.37 \pm 1.42$  in the patient group, it was

**Table 1.** Patients' age and gender distribution.

		Patient group	Control group	p value
Age		$7.06 \pm 2.67$	$7.77 \pm 2.84$	0.133
Gender	Male	47 (61%)	34 (55%)	0.465
	Female	30 (39%)	28 (45%)	

found as  $9.12 \pm 1.10$  in the control group ( $p=0.247$ ). Leukocyte, thrombocyte and MPV parameters were high in the patient group; however, the change was not statistically significant.

Mean lymphocyte value in the patient group was found as  $3.03 \pm 0.82$  and it was  $3.28 \pm 1.14$  in the control group ( $p=0.146$ ). Lymphocyte number was lower in the patient group; however, the change was not statistically significant (Table 2).

While mean NLR value in the patient group was  $1.43 \pm 0.54$ , it was found as  $1.16 \pm 0.51$  in the control group and the change was statistically significant ( $p < 0.001$ ). While mean PLR value in the patient group was found as  $113.78 \pm 35.78$  and it was found as  $103.61 \pm 32.32$  in the control group; however, the change was not statistically significant ( $p=0.084$ ) (Table 2).

## Discussion

Currently, COME is one of the most important health problem in children. COME prevalence varies much and it changes between 1.3–31.3%.<sup>[6,7]</sup> In the comprehensive study that was performed by Erdivanli et al.<sup>[8]</sup> COME prevalence was found as 9.9% in Turkey.

In COME etiology, there are viral or bacterial infections, Eustachian tube dysfunction, allergy and gastroesophageal reflux. There are studies that emphasize importance of the inflammation in COME etiopathogenesis. In the study that was performed by Yellon et al.,<sup>[9]</sup> it was found that interleukin-1-beta, interleukin-2, tumor necrosis factor-alpha and gamma-interferon cytokines are high in children with COME.

Smirnova et al.<sup>[10]</sup> determined in children with COME that pro-inflammatory cytokines (tumor necrosis factor-alpha, interleukin-1-beta, interleukin-6 and interleukin-8) and arachidonic acid metabolites are high.

**Table 2.** Patients' complete blood count parameters.

	Patient group	Control group	p-value
NLR	$1.43 \pm 0.54$	$1.16 \pm 0.51$	<0.001
PLR	$113.78 \pm 35.78$	$103.61 \pm 32.32$	0.084
WBC	$8.06 \pm 2.03$	$7.68 \pm 2.12$	0.283
Neutrophil	$4.17 \pm 1.37$	$3.55 \pm 1.50$	0.012
Lymphocyte	$3.03 \pm 0.82$	$3.28 \pm 1.14$	0.146
Platelet	$323.75 \pm 59.46$	$312.54 \pm 57.35$	0.264
MPV	$9.37 \pm 1.42$	$9.12 \pm 1.10$	0.247

MPV: Mean platelet volume; NLR: Neutrophil to lymphocyte ratio; PLR: Platelet to lymphocyte ratio; WBC: leukocyte

In the study performed by Somuk et al.<sup>[5]</sup> MPV parameter that is an inflammatory marker was examined preoperatively in the children with chronic effusion otitis media. MPV parameter was found high in the children with COME. Our study was performed with larger number of patient and control group. In our study, MPV parameter was found similarly high in the children with COME; however, the change was not statistically significant.

NLR and PLR values are the tests that can be calculated easily and that are quite cost-efficient. It was proposed that NLR is used as a new marker showing systemic inflammation. It was shown that NLR value might assist for determining short- and long-term mortality in acute coronary syndrome. Mortality increased in the patients having high NLR value.<sup>[11]</sup> Sudden sensorineural hearing loss is one of the emergencies of the otorhinolaryngology and inflammation in the etiopathogenesis has an important place. In the study performed by Ulu et al., NLR value was higher than the control group in the patients having sudden hearing loss. In the same study, there was a decrease in response to the treatment in the patients whose NLR value was high and this was stated as bad prognostic factor.<sup>[12]</sup> In the English literature, no study that investigated NLR as a diagnostic parameter in COME was encountered.

In our study, NLR value was found as statistically and significantly higher than the control group in similar age and gender distribution in the pediatric patients to whom ventilation tube was applied because of COME. NLR value, which is used as an inflammatory indicator, can be used in diagnosing the patients with COME.

Like NLR value, PLR value is an inflammatory marker that shows chronic inflammation, is cheap and does not necessitate additional cost. In the study performed by Azab et al. on 619 patients with non-ST-elevation myocardial infarction, it was shown that high PLR value increases the mortality rate.<sup>[13]</sup> In the English literature, no study that investigated PLR as a diagnostic parameter in COME was encountered. In our study, PLR parameter was found to be high in the children with COME; however, the change was not statistically significant.

## Conclusion

NLR value was statistically and significantly higher in the patients with COME. In COME diagnosis, NLR value can be used as the tests, which can be calculated easily, are cheap and that give fast results.

**Conflict of Interest:** No conflicts declared.

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