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Correlation between symptoms and Centor/McIsaac score in the diagnosis of tonsillopharyngitis

Tonsillofarenjit tanısında semptomlar ve Centor/McIsaac skoru arasındaki korelasyon

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Abstract

Purpose: Group A beta hemolytic streptococcus (GABHS) is identified in 20-40% of cases of childhood pharyngitis. The Centor/McIsaac score is an important scoring method used in the early diagnosis of patients presenting with symptoms of Group A beta hemolytic streptococcus (GABHS) pharyngitis. In this study, we aimed to determine the relationship between Centor / McIsaac score and patients' symptoms, and to investigate any conformity between Rapid Antigen Test positivity and high Centor/McIsaac score.

Materials and methods: Data were obtained retrospectively by scanning the files of patients (age 2 to 18 years) diagnosed with GAData were obtained retrospectively by scanning the files of patients (age 2 to 18 years) diagnosed with GABHS who were hospitalized between May and December 2017. Inclusion criteria were, being between the ages of 2 and 18 years and to be diagnosed with group A beta hemolytic streptococcal pharyngitis. Receiving antibiotic treatment within the last 14 days, being under 2 years of age and over 18 years of age are exclusion criteria. Daily clinical findings and test results (complete blood count, neutrophil and lymphocyte percentages, rapid antigen test, throat culture) were collected from medical records. The Centor/McIsaac scores calculated according to symptoms and rapid antigen test results used for GABHS antigen detection from throat swab samples, used for the initiation of effective treatment and to shorten hospitalization, were recorded from patient files. Student's t test was used to analyze the data that showed normal distribution among independent groups. The chi-square test was used for the analysis of categorical variables. $P<0.05$ was considered statistically significant.

Results: A total of 236 patients were included in the study. The average age of the patients was 7 years. The frequency of pharyngitis symptoms was similar in patients younger and older than 7 years of age. There was no statistically significant difference between those younger and older than 7 years of age in terms of throat culture positivity (p=0.059). There was no statistically significant difference between Centor/McIsaac scores of the two age groups (p=0.063). The Centor/McIsaac score (3.62±1.01) of those with positive rapid antigen test was significantly higher than that of those with negative rapid antigen test (2.78±1.28) (p=0.001). Centor/McIsaac scores of those with and without fever, those with and without tonsillar hypertrophy, those with and without cough were also compared. Centor/McIsaac scores of those with fever (3.53±1.02) were higher compared to those without (1.63±0.89) (p=0.001), scores were higher in those with tonsillar hypertrophy (3.68±1.01) compared to those without (2.10±0.97) (p=0.001), and scores were again higher in those without cough (3.67±1.07) compared to those with cough (2.22±0.99) (p<0.001).

Conclusion: The intensity of symptoms seen in GABHS infection leads to higher Centor/McIsaac scores. The correlation between rapid antigen test results and Centor/McIsaac score shows the increasing importance of Centor/McIsaac score in early diagnosis of GABHS pharyngitis.

Key words: Tonsillopharyngitis, Centor/McIsaac score, rapid antigen test.

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Öz

Amaç: A grubu beta hemolitik streptokok (GABHS) çocukluk çağı farenjit vakalarının %20-40'ında tanımlanır. Centor/McIsaac skoru A grubu beta hemolitik streptokok farenjiti semptomları ile başvuran hastaların erken tanısında kullanılan önemli bir skorlama yöntemidir. Bu çalışmada, Centor/McIsaac skor ile hastaların semptomları arasındaki ilişkiyi saptamayı ve Hızlı Antijen Test pozitifliği ile yüksek Centor/McIsaac skoru arasındaki herhangi bir uygunluğu incelemeyi amaçladık.

Gereç ve yöntem: Mayıs ile Aralık 2017 arasında hastanede yatmış olan GABHS tanısı alan hastaların (2 ila 18 yaş) dosyaları taranarak retrospektif olarak veriler elde edildi. Dahil edilme kriterleri 2 ve 18 yaş arasında olmak, A grubu beta hemolitik streptokok farenjit tanısı almasıdır. Son 14 gün içinde antibiyotik tedavisi almak, 2 yaş altında ve 18 yaş üstünde olmak dışlanma kriterleridir. Günlük klinik bulguları ve test sonuçları (tam kan sayımı, nötrofil ve lenfosit yüzdeleri, Hızlı antijen test, boğaz kültür) tıbbi kayıtlardan toplandı. Boğaz sürüntü örneklerinden GABHS antijeninin saptanması, etkin tedavi başlanması ve hastanede kalış süresinin kısaltılması için kullanılan; semptomlar ve hızlı antijen test sonuçlarına göre hesaplanan Centor/McIsaac skorları hasta

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dosyalarından kaydedildi. Bağımsız gruplar arasında normal dağılım gösteren verilerin analizinde Student t test kullanıldı. Kategorik değişkenlerin analizi için kikare testi kullanıldı. *P*<0,05 istatiksel olarak anlamlı kabul edildi.
Bulgular: Çalışmaya toplam 236 hasta dahil edildi. Hastaların ortalama yaşı 7 yaştı. 7 yaşından büyük ve küçük olan hastalarda farenjit semptomlarının sıklığı benzerdi. 7 yaş altındakiler ve üstündekiler arasında boğaz kültürü pozitifliği açısından istatiksel olarak anlamlı fark yoktu (*p*=0,059). İki yaş grubunun Centor/McIsaac skorları arasında istatiksel olarak anlamlı bir fark yoktu(*p*=0,063). Hızlı antijen testi pozitif olanların Centor/McIsaac skoru (3,62±1,01), hızlı antijen test negatif olanlarınkinden (2,78±1,28) anlamlı düzeyde yüksekti (*p*=0,001). Ateşi olanlar ve ateşi olmayanların, tonsiller hipertrofi olanların ve olmayanların, öksürük olmayanlar ve öksürük olanların Centor/McScorları da karşılaştırılmıştır. Ateşi olanların (3,53±1,02) ateşi olmayanlara göre (1,63±0,89) (*p*=0,001), tonsiller hipertrofi olanların (3,68±1,01) tonsiller hipertrofi olmayanlara göre (2,10±0,97) (*p*=0,001) Centor/McIsaac skorları daha yüksekti ve yine öksürük olmayanların (3,67±1,07) öksürük olanlara (2,22±0,99) (*p*<0,001) göre skorları daha yüksekti.
Sonuç: GABHS infeksiyonunda görülen semptomların yoğunluğu, daha yüksek Centor/McIsaac skorlara neden olmaktadır. Hızlı antijen test sonuçları ile Centor/McIsaac skorun arasındaki korelasyon, GABS farenjitinin erken tanısında Centor/McIsaac skorun öneminin arttığını göstermektedir.

Anahtar kelimeler: Tonsillofarenjit, Centor/McIsaac skor, hızlı antijen test.

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Introduction

'Group A beta hemolytic Streptococcus' (GABHS) infections most often manifest in the form of acute pharyngotonsillitis [1]. GABHS are identified in 20-40% of childhood pharyngitis cases [2]. In addition to fever, sore throat and dysphagia; headache, vomiting and abdominal pain may develop. The other symptoms of GABHS pharyngitis are pharyngotonsillitis, pharyngeal exudates and anterior cervical adenitis [3, 4].

Definitive diagnosis is made by culture isolation of GABHS from the pharynx, which requires around 48 hours for conclusive results. The rapid antigen detection test (RADT) is another method to assess such infections, and it can be completed in only a few minutes [5, 6].

The Centor/McIsaac score is comprised of the following parameters: greater than 38°C fever, no cough, painful or tender anterior cervical lymphadenopaty, occurrence of tonsillar exudate and being aged from 3 to 14 years old [7]. RADT accompanied with Centor/McIsaac score to detect GABHS enables differential diagnosis (viral vs. bacterial), thereby allowing early administration of necessary treatment [8, 9]. By comparing the Centor/McIsaac score (which is an easy and non-invasive evaluation) with the rapid antigen test, it will be possible to determine whether the Centor/McIsaac can provide more reliable information about the course of infection before performing a throat culture.

In this study we aimed to assess the pharyngitis symptoms and Centor/McIsaac scores, and to examine whether there was any relationship between RADT positivity and high Centor/McIsaac score.

Materials and methods

A retrospective study of patients examined at the Nigde Omer Halisdemir University (OHU) Faculty of Medicine between the dates of May 2017-December 2017 was made by researchers. Inclusion criteria were, being between the ages of 2 and 18 years and to be diagnosed with group A beta hemolytic streptococcal pharyngitis. Receiving antibiotic treatment within the last 14 days, being under 2 years of age and over 18 years of age are exclusion criteria. All patients aged 2 to 18 years who were hospitalized after being diagnosed with GABHS pharyngitis were included in the study. Ethics approval was given by Nigde Omer Halisdemir University School of Medicine, Clinical Research Ethics Committee (approval no: 2018/08-15). All procedures of the study conformed to the Declaration of Helsinki and its most recent amendments.

Medical records were reviewed to obtain the following information: visit time, demographic data, symptoms, physical exam findings (temperature, cervical lymphadenopathy, tonsillar hypertrophy), laboratory results (RADT, pharyngeal swab culture, complete blood count (CBC)). We used the RADT Quik test Strep-A Plus (BioMérieux) which is based on lateral_ flow immunoassay for GAS antigen detection from throat swab samples. Throat swab culture

was performed using standard methods via streaking on 5% sheep blood agar plates incubated anaerobically at 35^{0}C and examined at 48 hours with confirmation of GABHS using latex agglutination.

We used the Centor/McIsaac clinical score to evaluate GABHS in each patient. This scoring system is comprised of determining the presence or absence of the following criteria: painful and tender anterior cervical lymphadenopathy, absence of cough, a temperature of >38°C, being aged 3-14 years, occurrence of tonsillar exudate. One point is given for each criterion that is present in the Centor/McIsaac scoring. Then these points are summed and the final score is calculated; thus, overall score ranges from 0 to 5 points.

SPSS version 22 was used for all statistical analyses. Descriptive statistics were given using mean ± standard deviation for normally distributed variables. Student's t test was used to analyze the data that showed normal distribution among independent groups. Mann Whitney U test was used for the variables who did not show normal distribution. The chi-square test was used for the analysis of categorical variables. $P<0.05$ was considered statistically significant. $P<0.05$ values were defined as statistically significant.

Results

Among the 236 patients included in the study, 115 were girls and, 121 were boys. Mean age was 7 years. 109 children were under 7 years, 127 children were over 7 years. There was no statistically significant difference between the Centor/McIsaac scores of boy's and girl's *(*$p>0.05$*)*. The Centor/McIsaac scores and throat culture results of the patients were evaluated with respect to the 7-year age threshold. There was no statistically significant difference between children younger than and older than 7 years old in terms of Centor/McIsaac scores *(*$p=0.063$*)* and symptoms ($p>0.05$). Also, there was no significant difference between the frequency of throat culture positivity in those under 7 years old and those over 7 years old ($p=0.059$).

The summary of Centor/McIsaac criteria and the number of patients with <2 and ≥2 points are given in Table 1. The most common symptom in this group of patients was having a fever of than >38°C (84%). Comparison of Centor/McIsaac scores of patients with and without pharyngitis symptoms is shown in Table 2. The Centor/McIsaac scores of hospitalized patients with fever over 38°C were compared with those with fever below 38°C. Accompaniment of other scoring criteria was more frequent in those with fever above exceeding 38°C. As such, the mean Centor/McIsaac score of those with a fever over 38°C (3.53±1.02) was found to be significantly higher than the mean score of those with a fever below 38°C (1.63±0.89) ($p<0.05$). Higher Centor/McIsaac score is defined as having a score of ≥2 points. The frequency of having a Centor/McIsaac score of 2 and above was significantly higher in patients with a fever of >38°C.

The mean Centor/McIsaac score of patients without cough (3.67±1.07) was significantly higher than those with cough (2.22±0.99) ($p<0.05$). There was a significant difference in Centor/McIsaac scores with respect to tonsillar swelling ($p<0.05$). Patients with tonsillar hypertrophy had higher Centor/McIsaac scores (3.68±1.01) than patients without tonsillar

Table 1. The frequency of clinical characteristics of the patients and the distribution of Centor/McIsaac score

Symptoms and Centor/McIsaac score	n	%
Cough	101	42.8
>38°C fever	175	74.2
Tonsillar enlargement or exudate	142	60.2
Cervical lymphadenopathy	74	31.4
Sore throat	170	72
Centor/McIsaac score<2	32	13.6
Centor/McIsaac score≥2	204	86.4

hypertrophy (2.10±0.97). The percentage of patients with a Centor/McIsaac score of 2 or above was significantly higher in those with tonsillar hypertrophy compared to those without.

The mean Centor/McIsaac score of the patients was 3.05 in the study. The comparison of Centor/McIsaac scores with respect to rapid antigen test and throat culture results are shown in Table 3. The mean Centor/McIsaac score of patients with positive RADT result (3.62±1.01) was significantly higher than the mean Centor/McIsaascore of patients with negative rapid test result (2.78±1.28) (p<0.001). Also, the mean level of having a Centor/McIsaac Score of 2 or greater above was significantly more common among patients with rapid antigen test positivity (p<0.001). Significantly higher Centor/McIsaac scores were determined in patients with positive

Table 2. Comparison of Centor/McIsaac scores of patients with and without pharyngitis symptoms

		n		sd	t	p
Cough	Yes	101	2.22	0.99	-10.67	0.000*
	No	135	3.67	1.07		
>38^{0}C Fever	Yes	175	3.53	1.02	9.2	0.000*
	No	61	1.63	0.89		
Tonsillar hypertrophy	Yes	142	3.68	1.01	11.96	0.001*
	No	94	2.10	0.97		

*p<0.05

Table 3. Comparison of Centor/McIsaac scores of those with and without throat culture positive and those with or without rapid antigen test positive

		n		sd	t	p
Throat culture	Positive	68	3.75	0.95	3.14	0.001*
	Negative	168	2.76	1.26		
Rapid antigen test	Positive	76	3.62	1.01	5.05	0.001*
	Negative	160	2.78	1.28		

*p<0.05

throat culture (3.75±0.95) compared to those with negative culture (2.76±1.26) (p<0.05).

Overall, mean neutrophil percentage was 54% in this study group. There was no correlation between RADT positivity and neutrophil dominance (p>0.05). Patients with negative throat culture result were found to have significantly higher neutrophil percentage compared to those with positive culture.

Discussion

In this study, the occurrence of GABHS positivity in throat culture was found to be 33%. In Egyptian children GABHS frequency was 42.2% [10], and in other studies from Arab countries, the rate of GABHS pharyngitis was reported to be 40% and 41.5% [11, 12]. The frequency of GABHS was similar in Egypt and Arab-population studies. Since we included patients under 3 years of age, the likelihood of pharyngitis due to viral etiology was higher. Therefore, in the present study, GABHS frequency was lower in comparison to studies performed in Egyptian and Arabian populations.

In the present study, the Centor/McIsaac score of 68 patients with GABHS positive throat culture were found to be significantly higher than those with negative throat culture. Throat culture positivity appears to increase the likelihood of higher Centor/McIsaac score. Similar to our study, Stefaniuk et al. [13] stated that GABHS positive throat culture was present in 48% of those with a Centor/McIsaac score of 3, and in 50% of those with a Centor/McIsaac score of 4 or 5. There was a strong correlation between the results of positive throat culture result and Centor/McIsaac score (r=0.81). Fine et al. [14] compared patient's Centor/McIsaac scores

with the frequency of GABHS isolates and they were unable to find a correlation between Centor/McIsaac score and Streptococcus pyogenes isolation. Interestingly, Felsenstein et al. [15] stated that patients who had GABHS positivity in throat culture demonstrated lower Centor/McIsaac scores. The differences in the literature on this topic suggests that the criteria used in McIsaac scoring may also occur in viral infections.

Increased Centor/McIsaac score was in correlation with increased sensitivity of RADT. Dimatteo et al. [16] stated that the sensitivity of RADT increased markedly with increasing modified Centor scores; for patients with a Centor Score of 4, the sensitivity was 97%. Tanz et al. [17] stated that, among patients with McIsaac scores of >2, RADT sensitivity was 78%. Parallel to these studies, in our study, the mean Centor/McIsaac score of 76 patients with rapid test positivity were found to be significantly higher than those with negative rapid test result.

Çamurdan et al. [18] stated that GABHS prevalence varies greatly in patients younger than 72 months (25.2%) and those older than 72 months (53.9%). In our study, throat culture positivity was 33% in patients under 7 years and 31.5% in those older than 7 years of age. There was no statistically significant difference between these two age groups. The difference between two studies may be associated with the sample size (close to each other in both age groups in our study), throat swab technique, and high false positives.

We also investigated whether Centor/McIsaac scores were associated with fever, absence of cough and cervical lymphadenopathy findings. Other studies in the literature did not investigate the relationships between specific symptoms and the overall Centor/McIsaac score. This is another feature that distinguishes our study from the literature.

Our study has some limitations, including its retrospective nature. Secondly, the number of patients is relatively low for the evaluation of such a common pathogen, which represents it is another limitation of the study. Furthermore, since the specific microorganisms grown in culture were not evaluated, we could not perform any investigations pertaining to the type of microorganism.

In conclusion, the intensity of symptoms seen in GABHS infection causes higher Centor/McIsaac scores. The correlation between rapid antigen test results and Centor/McIsaac score appears to increase the value and reliability of the Centor/McIsaac score in the early diagnosis of GABHS. We can conclude that the relationship between the rapid antigen test and Centor /McIsaac score will contribute to the correct management of GABHS pharyngitis.

Conflict of interest: No conflict of interest was declared by the authors.

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Contributions of authors

Z.Y.Ö. designed the main idea and hypothesis of the study. Z.Y.Ö. and G.G. developed the theory and organised the material method section. G.G. and Z.Y.Ö. performed the evaluation of the data in the results section. The discussion section of the article was written by Z.Y.Ö. and G.G. reviewed the article, made the necessary corrections and approved. In addition, all authors discussed the entire study and approved its final version.