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Retrospective Evaluation of Patients Admitted to the Emergency Department with Acute Ischemic Stroke; Analysis of 50 Cases

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Abstract

Aim: The aim of this study is to contribute to the literature by investigating the relationship of the data obtained from the patients presented to our emergency service with acute ischemic stroke with the prognosis of patients.

Materials and methods: The study was conducted over the files of all patients applied to emergency service and obtained acute ischemic stroke (AIS) diagnosis between 01.01.2019-31.12.2019. All patients over 18 with accessible data and diagnosed with AIS were included in the study. Patients without of AIS type, and younger than 18, or without accessible data were excluded.

Results: A total of 50 patients were included in the study. The average age of the patients was 69.74±11.72. Among the patients, 20 (40%) were female. The analysis of application complaints of the cases revealed that 30 (60%) patients had loss of power in extremities. The leading medical history of patients were smoking 35 (70%) and hypertension 34 (68%). The laboratory results of the cases revealed the CRP as 22.11±37.45 mg/L and neutrophil lymphocyte ratio (NLR) as 3.05±1.93. According to Modified Rankin Scale (MRS), 30 (60%) of the cases had a score equal and lower than 2, and 20 (40%) of them had a score of 3 or higher. NLR was statistical significance at differentiating between dependent and independent patients groups according to MRS.

Conclusion: Although there are studies suggesting the use of NLR as a prognosis marker in AIS, for the generalization of these data they should be supported with many further randomized and controlled studies.

Key words: Emergency service, acute ischemic stroke, modified rankin score, neutrophil-lymphocyte ratio, prognosis

Introduction

The leading reasons of death are circulatory system related disorders according to 2019 data of the Turkish Statistical Institute[1]. Deaths caused by circulatory system related disorders were determined to be due to ischemic heart disorder (39.1%), cerebrovascular diseases (22.2%), and other cardiac diseases[1].

Cerebrovascular diseases (CVD), which are among the uppermost causes in terms of mortality and morbidity in Turkey as well as worldwide, were defined as "Temporary or permanent condition of a brain area due to ischemia or hemorrhage, and/or primary pathological damage of one or more arteries of the brain" by National Institute of Neurological Disorders and Stroke (NINDS)[2].

World Health Organization has defined the stroke syndrome, which is commonly confronted as CVD in emergency service as "Symptoms related with focal or global dysfunction of cerebral functions which are rapid, persisting for 24 or more hours, or resulting in death"[3]. These stroke cases are 80-85% ischemic origin and 15-20% hemorrhagic origin[3,4].

Even though the mortality and morbidity rates of high, number of studies investigating the relation of clinical symptoms of acute ischemic stroke patient detected in the emergency services and prognosis of these patients are quite limited. In this study, we aimed to determine the efficiency of symptoms of acute ischemic stroke patients applied to our emergency service in terms of determining the prognosis of the patients.

Materials and methods

The required ethics council approval was obtained prior to this retrospective study from Ethical Council of Faculty of Medicine, Namık Kemal University (30.03.2021/202178.03.18). The study was conducted over the files of patients who have applied to a tertiary health care emergency service and obtained acute ischemic stroke diagnosis between 01.01.2019-31.12.2019. All patients over 18 with accessible data and diagnosed with acute ischemic stroke were included in the study. Patients without CVD of acute ischemic type, and younger than 18, or without accessible data were excluded. In order to gather the standard patient data, a case report form was prepared. This form include age, sex, smoking status, complaints, hemogram values, liver function tests, other diseases such as hypertension (HT), diabetes mellitus (DM), coronary artery disease (CAD), chronic obstructive

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Table 1. Demographic and clinical characteristics of the cases

	n(%) Mean ± std
Age	69,74 ± 11,72
Gender	
Female	20(%40)
Male	30(%60)
Smoking	35(%70)
Chronic diseases	
HT	34(%68)
DM	17(%34)
CAD	4(%8)
COPD	18(%36)
CHF	2(%4)
MRS	
3≤	20(%40)
2≥	30(%60)
Outcome	
Hospitalization (NICU)	47(%94)
Hospitalization (ICU)	3(%6)

HT: Hypertension, **DM:** Diabetes mellitus, **CAD:** Coronary artery disease, **COPD:** Chronic obstructive pulmonary disease, **CHF:** Congestive heart failure, **MRS:** Modified Rankin Scale, **std:** standard deviation, **NICU:** non intensive care unit, **ICU:** intensive care unit

Table 2. Complaints of the cases applying to the emergency department

	n(%)
Loss of strength on the right side of the body	13(%26)
Loss of strength on the left side of the body	17(%34)
Speech disorder	19(%38)
Dizziness	3(%6)
Other*	9(%18)

*: numbness in the extremities, numbness of the tongue, slipping of the lips, fainting, confusion, sudden forgetfulness

Table 3. Laboratory findings of the cases

	Mean±Std	Cut-off range
NLR	3,05±1,93	None
CRP mg/L	22,11±37,45	0 - 5
WBC 10^3/uL	8,27±2,68	4 - 10,5
Neutrophil 10^3/uL	5,37±2,35	1,5 - 6,6
Lymphocyte 10^3/uL	2,03±0,74	1,5 - 3,5
Platelet 10^3/uL	235,7±68,5	132 - 356
ALT IU/L	21±17	0 - 41
AST IU/L	26±21	0 - 40
GGT IU/L	37±34	0 - 60
ALP IU/L	65±24	40 - 129
LDH IU/L	211±71	135 - 225

NLR: Neutrophil/lymphocyte ratio, WBC: white blood cell, std: standard deviation

pulmonary disease (COPD), congestive heart failure (CHF); scan images, and Modified Rankin Scores (MRS). All data were obtained from patients files. All laboratory results were selected from the first results obtained at the time of patients' application to emergency service. Physical exam results were recorded individually for each patient. Later the results were categorized as right paraparesis/plegia, left paraparesis/plegia, dysarthria, dizziness, and other depending on the frequency. Cases were classified as dependent (MRS ≥ 3) and independent (MRS ≤ 2) depending on the MRS system. Power of the study was confirmed to be over 80% by the power analysis of the sample size.

Statistical method

The data were analyzed using the database prepared in SPSS 22.0 package program. Chi-square test, Fischer's exact test and independent t tests were used for analysis. $P < 0.05$ was accepted as statistically significant. For the categorical variables, descriptive statistics were expressed with number (n) and percentage (%); while continuous variables were expressed as median and standard deviation. In order to compare the data among the groups Chi-square test was used. The normality of the distributions of continuous variables was evaluated using Kolmogorov-Smirnov test. For the comparison of groups Mann Whitney U-test was used.

Results

For this study 75682 patient files were examined. A total of 242 patients with CVD in ICD code were further selected for advanced analysis. After evaluation by including and excluding criteria, 50 patients were included in the study.

The average age of the patients in the study was 69.74±11.72. Among the patients, 20 (40%) were female and 30 (60%) were male. The leading medical history of patients were smoking in 35 patients (70%) and hypertension (HT) in 34 patients (68%), CAD in 18 (36%), DM in 17 (34%), COPD in 4 (8%), and CHF in 2 (4%) (Table 1).

The analysis of application complaints of the cases revealed that 13 patients (26%) had loss of power in the right side of the body, 17 (34%) had loss of power in the left side of the body, 19 (38%) had dysarthria and 3 (6%) had dizziness. A total of 9 patients (18%) were experiencing other symptoms (paresthaesia in extremities, paresthaesia in tongue, shift in lips, fainting, brain fog, sudden dysmnesia) (Table 2).

The lab result analysis revealed the CRP values to be 22.11 ± 37.45 mg/L, WBC 8.27 ± 2.68 10^3/uL, neutrophil value 5.37 ± 2.35 10^3/uL, and lymphocyte value to be 2.03

Table 4. Olguların MRS'ye göre bağımlılık durumunun diğer parametreler ile karşılaştırılması

	MRS≤2	MRS≤2	p
NLR	3,46±2,13	2,38 ± 0,75	0,04
Hospitalization (NICU)	28	19	0,6
Hospitalization (ICU)	1	2	0,8
CRP mg/L	32,27 ±53,19	15,46± 2,49	0,2
Age	70,25 ±10,91	69,40 ±12,4	0,8

MRS: Modified Rankin Scale, **NICU:** non intensive care unit, **ICU:** intensive care unit, **NLR:** Nötrofil/ lenfosit oranı, **CRP:** C-reactive protein

± 0.7 10^3/uL. Neutrophil/Lymphocyte ratio (NLR) was 3.05 ± 1.93. Other laboratory results of the cases are given in Table 3.

Among the cases, three were taken into intensive care unit for advanced treatment, while 47 were hospitalized in the service. Although all the three patients taken into ICU were males, no statistically significant correlation between sex and hospitalization was detected (P= 0.2).

Moreover, no statistically significant correlation between comorbid disease history and hospitalization was detected (P= 0.55).

According to MRS, 30 (60%) of our cases had a score of 2 and lower, and 20 (40%) had 3 or more. Cases' dependent or independent status was determined not to be significantly affected from hospitalization condition selected for follow-up and treatment (P= 0.2). Similarly, the comparison of MRS and ages of the patients showed that there was no significant relationship (P= 0.8). The NLR was found to be significant in differentiating cases as dependent and independent (P= 0.04) (Tablo 4). The cut-off value was found to be 2.85 at the likelihood ratio of 3. NLR was detected to differentiate the cases as dependent and independent with a 55% sensitivity and 78% specificity (AUC: 0.65, 95% CI: 0.48-0.86).

Discussion

Stroke is one of the most common neurological diseases we come across in the emergency services, and age is one of the most significant risk factors for stroke. Almost 70% of patients with stroke are known to be over 65[5]. The study by Reganon et al. revealed the average age of patients with ischemic stroke to be 65.3 ± 8.2[6], while Yoneda et al. stated it to be 70 ± 11[7], Williams et al. to be 64± 3[8], and Hakbilir et al. to be 63.5 ± 13.6[9]. The average age of patients with ischemic stroke was found to be 69.74±11.72 consistent with the literature.

Among various studies including all age groups, acute ischemic stroke was determined to be more frequent among males[9-12]. Our results were consistent with the literature. We also suggest that being male is a risk factor for CVD. Moreover, we believe that the consistency of demographic features of our study such as age and sex with the literature is a proof for the confirmation of the validity of the patients' data included in this study.

Smoking, HT and DM are among the most common risk factors for stroke[13-16]. Efstathiou et al. determined that 52.6% of the 192 ischemic stroke patients had HT history[17]. Silvestrelli et al. detected HT in 61% of the 2395 stroke patients[18]. Rabkin et al. indicated HT to be the most frequent risk factor as found 53.1% of 1392 ischemic stroke cases[14]. Pancioli et al. reported that 13% of stroke patients had DM[19]. Du et al. also reported that 19.9% of the ischemic stroke patients had DM[20]. Our results revealed that smoking, HT and DM were the most common patient history with 70%, 68% and 34%, respectively. We believe that pathological change in the vascular-endothelial structure due to HT, DM and smoking causes a risk for stroke.

CRP is used as a biomarker with high sensitivity in many diseases especially where inflammatory cascade takes a role. Chang et al. reported a significantly higher CRP values in ischemic stroke patients compared to the control group[21]. Palasik et al. reported that CRP level significantly increases right from the first day in ischemic stroke[22]. Rost et al. detected a significant increase in plasma CRP concentrations both in acute ischemic stroke and temporary ischemic attack[23]. High CRP levels are known to increase ischemic stroke two fold in men, and cause 7 fold increase in stroke or myocardium infarcts with 5 fold increase by any vascular incident in women[24, 25]. Indeed, we detected high CRP levels in stroke patients in our study. Even though we did not detect a significant correlation between CRP and MRS in our study, we suggest that CRP can represent an inflammation related to the aetiopathogenesis of ischemic stroke as an acute phase reactant and can be used as a plasma marker for atherotrombotic diseases.

MRS is a scale used in the follow-up of stroke patients and it determines the intension of stroke, and is used to detect the dependency, and to evaluate the functional recovery. According to this scale, the ones with 1 and 2 scores survive independently, while the ones with 3 or more keep living dependently. Besides MRS being the most common and most frequently used prognosis scale, there are data showing that NLR can also provide efficient data on prognosis[26-28].

Neutrophils are the earliest leucocyte subtype that are released from the related sections after acute ischemic stroke happens[29]. Moreover, they are known to contribute to the

negative effects of ischemic damage by releasing of toxic inflammatory cytokines[30,31]. Aytaç et al. stated that NLR values increase in stroke cases[26]. Kocatürk et al. evaluated the correlation between NLR with 3 months mortality in 107 diseases, and reported a relation between NLR and infarct volume[27]. Demir et al. compared NLR and MRS and found that NLR is significantly higher in poor prognosis[28]. Our results were consistent with the literature.

Limitations of the study

The narrow sample size and not excluding the other possible inflammatory diseases of the cases were the most important limitations of this study. Moreover, there is the limitation resulted from the ignorance of a possible inflammation process depending on the use of the values in blood test drawn during the application to emergency service which was used to determine the NLR

Conclusion

To conclude, elder, smoking status, HT, and DM are still among the risk factors for acute ischemic stroke. MRS has been frequently used for the prognosis follow up of the patients. Although there are studies suggesting the use of NLR as a prognosis marker, for the generalization of these data they should be supported with many further randomized and controlled studies.

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