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Comparison of Laboratory Parameters During Herpes Zoster Infection: A Case-Control Study

Herpes Zoster Enfeksiyonu Sırasında Laboratuvar Parametrelerinin Karşılaştırılması: Bir Olgu Kontrol Çalışması

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ABSTRACT Objective: We aimed to find the parameters that can change during herpes zoster infection and observe the relationship of these parameters throughout the disease. **Material and Methods:** We compared 40 herpes zoster patients and 2 separate control groups, who were healthy and had comorbidities similar in age and gender. Patient files were retrospectively analyzed, and laboratory parameters were compared between groups. The laboratory values of the patient group with herpes zoster were evaluated among themselves according to the duration of the symptoms. **Results:** Fasting glucose, creatinine, aspartate aminotransferase values, the percentage and the absolute number of monocytes, red blood cell distribution width-coefficient of variation, and C-reactive protein levels of the patients with herpes zoster were significantly higher, and the absolute number of lymphocytes, mean corpuscular volume and platelet distribution width levels were lower than the control groups. The percentage of monocytes in the first 5 days was significantly higher than in the following days, and hematocrit values were lower in the last days. **Conclusion:** Examining routine laboratory values during diseases may help diagnose the disease, especially in patients with faint clinical signs and zoster sine zoster. In addition, it may be useful to question patients with herpes zoster for renal dysfunction, rheumatological diseases, and malignancy.

Keywords: Aspartate aminotransferase; herpes zoster; monocytes; platelet distribution width

ÖZET Amaç: Herpes zoster enfeksiyonu sırasında değişebilen parametreleri bulmayı ve bu parametrelerin hastalık süresi ile ilişkisini gözlemlemeyi amaçladık. **Gereç ve Yöntemler:** Herpes zosterli 40 hasta ile yaş ve cinsiyetleri benzer sağlıklı ve ek hastalıkları olan 2 ayrı kontrol grubu karşılaştırıldı. Hasta dosyaları geriye dönük olarak incelendi ve gruplar arasında laboratuvar parametreleri değerlendirildi. Herpes zosterli hasta grubunun laboratuvar değerleri, semptomların süresine göre kendi aralarında değerlendirildi. **Bulgular:** Herpes zosterli hastaların açlık glukozu, kreatinin, aspartat aminotransferaz değerleri, monosit mutlak sayısı ve yüzdesi, kırmızı kan hücresi dağılım genişliği-varyasyon katsayısı ve C-reaktif protein düzeyleri kontrol gruplarına göre anlamlı olarak yüksek; lenfosit mutlak sayısı, ortalama korpüsküler hacim ve trombosit dağılım genişliği düzeyleri ise daha düşüktü. İlk 5 gündeki monosit yüzdesi sonraki günlere göre anlamlı derecede yüksekti. **Sonuç:** Hastalıklar sırasında rutin laboratuvar değerlerinin incelenmesi, özellikle silik klinik bulguları olan ve zoster sine zoster olan hastalarda hastalığın teşhisine yardımcı olabilir. Ayrıca herpes zosterli hastaların böbrek fonksiyon bozukluğu, romatolojik hastalıklar ve malignite açısından sorgulanması faydalı olabilir.

Anahtar Kelimeler: Aspartat aminotransferaz; herpes zoster; monositleri; trombosit dağılım genişliği

Herpes zoster is an infection accompanied by dermatomal rash and pain resulting from the varicella-zoster virus (VZV) reactivation. VZV-specific T-cell response occurs during primary VZV infection.[1] Viral reactivation occurs because of decreased cell-mediated immunity to the virus and becomes more frequent with increasing age. Disease or drug-induced immunosuppression, trauma, X-ray radiation, infection, and malignancy are other triggers for viral reactivation.[2] Sixty-eight percent of herpes zoster cases occur at 50 years or older. It has been reported that approximately 8% of herpes zoster episodes occur in immunocompromised patients.[1]

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Although herpes zoster is a common disease, to our knowledge, there is not enough study in the literature about the changes it could make on the laboratory parameters. During the disease process, we compared the complete blood count, blood urea nitrogen (BUN), creatinine, fasting glucose, alanine aminotransferase (ALT), aspartate aminotransferase (AST), C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), ferritin values of herpes zoster patients with 2 age and gender-adjusted control groups that are healthy or have comorbidities except herpes zoster. Recognizing the laboratory parameters that can change during the attack periods of any disease, helps us to make the diagnosis more quickly in our clinical practice and to start the treatment earlier. In this study, we aimed to find the laboratory parameters that can change during herpes zoster infection and observe the relationship of these parameters throughout the disease.

MATERIAL AND METHOD

Patients who applied to the dermatology outpatient clinic between 01.08.2018-01.08.2021 and were diagnosed with herpes zoster were included in the study. Patients' files were retrospectively analyzed, and their age, gender, comorbidities, medications, herpes zoster clinical features, complete blood count, fasting glucose, BUN, creatinine, AST, ALT, ESR, CRP, and ferritin levels were recorded. Patients whose blood samples were not taken during the attack were excluded from the study. The dermatome where herpes zoster was localized was recorded according to the information specified in the patient file. The laboratory values of the patient group with herpes zoster were evaluated among themselves, according to the duration of the symptoms.

The patient group was divided into 3 groups 1-5th days, 6-10th days, and 10-15th days according to the onset of symptoms on the day of the examinations. The laboratory values were compared according to the duration of the symptoms.

Control groups were selected among the patients who applied to the check-up outpatient clinic. Two separate control groups were created: one with no disease and other had comorbid diseases. The gender and age of the control groups were adjusted to the patient group, in case it might affect laboratory parameters. Same parameters were recorded in both patient group and the control groups.

Maltepe University Clinical Research Ethics Committee approved our study (date: March 02, 2022, no: 2022/900/17) and it was conducted in accordance with the Declaration of Helsinki II.

STATISTICS

As a result of the analysis made with G*Power version 3.1.9.7 (Erdfelder, Faul, & Buchner, 1996, Germany), it was calculated that it would be sufficient to reach 66 people, according to Cohen's recommended effect size of 40% large, 80% power, and 3 groups comparison. In the study, the sample consisted of 144 people and was accepted as sufficient.

In the analysis, normal distribution was checked with skewness and kurtosis. According to the distribution, one-way ANOVA and Kruskal Wallis H tests were used. LSD test and Dunn test were used in post-hoc analysis. Windows SPSS Version 24.0 (SPSS, Inc., Chicago, IL, USA) was used for all statistical analyses. p-value <0.05 was considered statistically significant.

RESULTS

Forty patients with herpes zoster, and 2 control groups [with no disease (n=48) or have comorbid diseases (n=56)] were included in our study, having mean ages of 57.95±17.19, 54.08±8.61, 59.07±7.65, respectively (p=0.067). There was no statistical difference between the patient and control groups in terms of age and gender.

Herpes zoster was located in cranial dermatomes in 6 (15%) patients, cervical in 6 (15%) patients, thoracic in 13 (32.5%) patients, and lumbar in 12 (30%) patients, and sacral dermatomes in 3 (7.5%) patients.

In the herpes zoster patient group, 22.5% had diabetes, 35% had cardiovascular disease, 10% had hypothyroidism, 10% had renal dysfunction, 10% had a rheumatological disease, and 10% had malignancy. In the control group with comorbid diseases, 21.4% had diabetes, 53.6% had cardiovascular disease, 12.5% had hypothyroidism, 1.8% had renal dysfunction, 3.5% had rheumatological disease, and 3.5% had malignancy.

Fasting glucose, creatinine, CRP, and AST values of the herpes zoster patients were significantly higher than the control groups (p=0.013, p=0.014, p=0.001, and p<0.001, respectively) (Table 1).

The percentage and the absolute number of monocytes were significantly higher in the patient group than the control groups' values (p=0.043, p=0.001, respectively) (Table 1).

The red blood cell distribution width-coefficient of variation (RDW-CV) values were statistically significantly higher, and the absolute number of lymphocytes, the mean corpuscular volume (MCV) and the platelet distribution width (PDW) values were lower in the patient group with herpes zoster than the control groups' values (p=0.016, p=0,037, p=0.029, p<0.001, respectively) (Table 1).

When the values were compared according to the duration of the symptoms, a statistically significant difference was determined in the percentage of monocytes and the hematocrit values. The percentage of monocytes during the first 5 days was significantly higher than the following days (p=0.002). Hematocrit values were found to be lower for 11-15 days compared to those in the early days of the disease (p=0.046) (Table 2).

There was no significant difference between the groups in other laboratory values (Table 1, Table 2).

DISCUSSION

Herpes zoster is one of the diseases that are frequently encountered in clinical practice. We aimed to evaluate the laboratory parameters that can change during herpes zoster infection and observe the relationship of these parameters throughout the disease. We compared the laboratory parameters of the herpes zoster patients during the disease process with the control groups. In our study the absolute number and percentage of monocytes, RDW-CV, AST, fasting glucose, creatinine, and CRP values were found to be higher, and the absolute number of lymphocytes, MCV and PDW were lower in the herpes zoster patients than the control groups.

It has been reported that the presence of monocytosis in the acute phase in varicella and herpes zoster is statistically significant when compared with herpes simplex virus infection, measles, and rubella.[3] Similarly, we found that the number and percentage of monocytes in the patient group were higher than the values in the control groups. We found that this higher value was more pronounced in the first 5 days of the disease. Reactive monocytosis is a nonspecific or non-sensitive condition that can accompany many infectious or inflammatory conditions.[4] However, it can be considered as a finding that can support the diagnosis of herpes sine zoster, which presents with dermatomal pain without lesions, especially in the preliminary diagnosis of zoster.

It was found that the absolute lymphocyte count was low in patients with herpes zoster compared to the control group, and it was reported that low levels of CD3+ and CD8+ T cells might play a role in varicella-zoster reactivation.[5,6] We also found that our patients' absolute lymphocyte count was lower compared to the control groups. Our data also support this view.

In another study, RDW has been reported to be higher in cancer patients than the healthy control group.[7] RDW values were also higher in our herpes zoster patient group than the control groups. In our study group, cancer rates were higher in the patient group with herpes zoster compared to the control groups, and the difference in RDW values between the groups may be due to this.

AST is an enzyme found in the liver, kidney, brain, muscle, and erythrocytes. Higher levels of this enzyme indicate damage to these organs or cells.[8] ALT is another enzyme that has higher levels that are more related to liver damage.[9] We found that there was a statistically significant increase in AST levels in patients with herpes zoster than values in the control groups, whereas there was no difference in ALT levels. This may be due to the fact that herpes zoster can cause damage the muscles as well as the skin.

Diabetes mellitus and kidney failure are among the risk factors for herpes zoster.[10] We found that fasting glucose levels were higher in patients with herpes zoster compared to the healthy control group, and creatinine levels were higher than the values in both control groups. Since creatinine levels may be higher

TABLE 1: Comparison of laboratory values by groups.

		n	Mean±SD	Median (Q1-Q3)	p value	Significance
Fasting glucose (mg/dL)	Control A[0]	48	96.67±8.43	97 (90.25-100)	[a]**0.013***	1.2>0
	Patient[1]	37	116.05±51.56	103 (92.5-118.5)		
	Control B[2]	56	110.34±30.9	101.5 (93.25-114)		
Creatinine (mg/dL)	Control A[0]	48	0.79±0,.1	0.75 (0.66-0.88)	[b]**0.014***	1>0.2
	Patient[1]	39	0.95±0.36	0.84 (0.71-1.14)		
	Control B[2]	56	0.83±0.19	0.83 (0.67-0.94)		
AST (U/L)	Control A[0]	48	18.02±5.55	17 (14-20)	[b]**0.000****	1>0.2
	Patient[1]	39	23.13±7.24	22 (17-29)		
	Control B[2]	56	18.54±5.7	17.5 (15-21)		
ALT (U/L)	Control A[0]	48	28.98±12.01	28 (22-36.5)	[a]0.324	-
	Patient[1]	39	33±12.46	31 (23-40)		
	Control B[2]	56	32.02±14.09	29 (23-36)		
ESR (mm/h)	Control A[0]	28	15.25±11.84	13 (6.25-19.75)	[a]0.297	-
	Patient[1]	17	19.06±10.6	17 (10.5-30)		
	Control B[2]	11	15.82±13.27	10 (5-29)		
Leucocyte (/mm^3)	Control A[0]	48	7.4±2.39	6.81 (5.59-8.67)	[b]0.346	-
	Patient[1]	38	8.11±4.1	7.18 (6.06-9.05)		
	Control B[2]	56	7.29±1.9	6.93 (5.99-8.54)		
Neutrophils (%)	Control A[0]	48	55.76±10.87	56.75 (50.33-63.13)	[a]0.361	-
	Patient[1]	38	57.78±11.64	58.2 (51.88-64.1)		
	Control B[2]	56	55.26±7.8	56.35 (49.75-60.43)		
Lymphocytes (%)	Control A[0]	48	31.63±8	31.5 (25.75-38.95)	[b]0.090	-
	Patient[1]	38	29.40±11.56	27.65 (21.38-33.43)		
	Control B[2]	56	33.51±7.65	32.9 (29.23-38.45)		
Monocytes (%)	Control A[0]	48	8.22±2.51	7.6 (6.7-9.62)	[a]**0.043***	2>1
	Patient[1]	38	9.89±4.04	9.1 (6.83-12.63)		
	Control B[2]	56	7.88±1.9	7.99 (6.43-9.2)		
Eosinophils (%)	Control A[0]	48	3.05±2.4	2.3 (1.43-3.7)	[b]0.491	-
	Patient[1]	38	2.54±1.43	2.3 (1.48-3.93)		
	Control B[2]	56	2.79±1.87	2.2 (1.6-3.58)		
Basophils (%)	Control A[0]	47	0.5±0.37	0.4 (0.2-0.86)	[b]0.080	-
	Patient[1]	38	0.37±0.22	0.3 (0.2-0.5)		
	Control B[2]	56	0.53±0.39	0.43 (0.2-0.7)		
Neutrophils (/µl)	Control A[0]	48	4.26±1.7	3.8 (3-5.23)	[b]0.381	-
	Patient[1]	38	4.55±1.74	3.94 (3.35-5.42)		
	Control B[2]	56	4.08±1.42	3.74 (3.01-5)		
Lymphocytes (/µl)	Control A[0]	48	2.29±0.85	2.11 (1.82-2.75)	[b]0.037	-
	Patient[1]	38	2.06±0.70	2.21 (1.49-2.52)		
	Control B[2]	56	2.4±0.67	2.26 (1.83-2.87)		
Monocytes (/µl)	Control A[0]	48	0.59±0.21	0.58 (0.43-0.7)	[b]**0.001****	1>0.2
	Patient[1]	38	0.74±0.28	0.74 (0.52-0.96)		
	Control B[2]	56	0.57±0.19	0.55 (0.4-0.72)		
Eosinophils (/µl)	Control A[0]	48	0.22±0.19	0.15 (0.1-0.27)	[a]0.904	-
	Patient[1]	38	0.19±0.1	0.17 (0.11-0.25)		
	Control B[2]	56	0.2±0.15	0.14 (0.1-0.24)		
Basophils (/µl)	Control A[0]	47	0.03±0.02	0.03 (0.02-0.05)	[a]0.409	-
	Patient[1]	38	0.03±0.01	0.02 (0.02-0.04)		
	Control B[2]	56	0,04±0,03	0.03 (0.02-0.05)		
Hemoglobin (g/dL)	Control A[0]	48	13.76±1.43	13.65 (13.03-14.88)	[b]0.937	-
	Patient[1]	38	13.86±1.61	13.8 (13.08-15.33)		
	Control B[2]	56	13.75±1.67	13.9 (12.83-14.88)		

TABLE 1: Comparison of laboratory values by groups *(devamı)*.

		n	Mean±SD	Median (Q1-Q3)	p value	Significance
MCV	Control A[0]	48	87.40±11.33	89.43 (85.53-92.15)	[a]**0.029***	1>0
	Patient[1]	38	85.73±5.51	86.8 (82.55-88.43)		
	Control B[2]	56	87.04±5.3	87.9 (83.5-90.15)		
RDW-CV	Control A[0]	48	13.38±1.26	13.3 (12.8-13.8)	[a]**0.016***	1>0
	Patient[1]	38	14.15±1.79	13.9 (13.18-14.8)		
	Control B[2]	56	13.74±1.38	13.55 (12.75-14.28)		
Platelet (/µl)	Control A[0]	48	240.27±47.3	235.5 (208-261)	[b]0.245	-
	Patient[1]	38	227.39±58.77	220 (177.75-269)		
	Control B[2]	56	246.88±58.83	236 (197.75-275.5)		
MPV	Control A[0]	48	9.7±1.42	9.7 (9.13-10.7)	[b]0.762	-
	Patient[1]	38	9.89±0.89	9.8 (9.1-10.83)		
	Control B[2]	56	9.71±1.4	9.94 (8.73-10.7)		
RBC	Control A[0]	48	4.74±0.48	4.73 (4.38-5.08)	[b]0.440	-
	Patient[1]	38	4.86±0.47	4.78 (4.48-5.26)		
	Control B[2]	56	4.83±0.44	4.83 (4.51-5.12)		
Hct	Control A[0]	48	41.84±4.04	42.17 (38.88-44.48)	[b]0.873	-
	Patient[1]	38	41.57±4.07	42.45 (39.43-44.63)		
	Control B[2]	56	42.02±4.08	42.21 (39.5-44.4)		
MCH	Control A[0]	48	29.16±2.56	29.56 (28.45-30.44)	[b]0.532	-
	Patient[1]	38	28.55±1.,99	28.8 (27.4-30.23)		
	Control B[2]	56	33.43±37.43	28.86 (27.01-29.8)		
MCHC	Control A[0]	48	32.89±0.9	32.8 (32.3-33.5)	[b]0.053	-
	Patient[1]	38	33.31±1.27	33.3 (32.45-34.43)		
	Control B[2]	56	32.69±1.38	32.8 (31.85-33.58)		
RDW-SD	Control A[0]	33	42.67±2.64	42.8 (40.7-44.75)	[a]0.243	-
	Patient[1]	38	42.96±3.69	42.3 (40.53-45.73)		
	Control B[2]	34	44.11±3.66	43.45 (41.88-45.1)		
PCT	Control A[0]	48	0.23±0.06	0.23 (0.19-0.27)	[b]0.450	-
	Patient[1]	38	0.22±0.05	0.22 (0.18-0.25)		
	Control B[2]	56	0.24±0.06	0.24 (0.2-0.28)		
PDW	Control A[0]	48	14.32±3.66	12.85 (11.4-16.65)	[b]**0.000****	0>1
	Patient[1]	38	11.97±1.89	11.6 (10.6-13.45)		
	Control B[2]	56	14.83±3.98	13.15 (11.83-19.02)		
CRP (mg/dL)	Control A[0]	30	0.34±0.3	0.28 (0.1-0.52)	[a]**0.001****	1>0
	Patient[1]	16	3.46±3.74	2.2 (0.43-5.84)		
	Control B[2]	10	0.43±0.28	0.37 (0.24-0.54)		
Ferritin (ng/mL)	Control A[0]	25	100.27±89.43	69.1 (37.45-145.55)	[b]0.563	-
	Patient[1]	19	87.05±94.27	55 (18-150)		
	Control B[2]	55	79.7±68.58	64.9 (21-129.5)		

[0]: Control A; [1]: Patient; [2]: Control B; [a]: Kruskal Wallis H; [b]: One way ANOVA: *: p<0.05; **: p<0.01;***: p<0.001; SD: Standard deviation; CRP: C-reactive protein; ESR: Erythrocyte sedimentation rate; Hct: Hematocrit; MCH: Mean corpuscular hemoglobin; MCHC: Mean corpuscular hemoglobin concentration; MCV: Mean corpuscular volume; MPV: Mean platelet volume; PCT: Plateletcrit; PDW: Platelet distribution width; RBC: Red blood cell count; RDW: Red blood cell distribution width; RDW-CV: Red blood cell distribution width-coefficient of variation; RDW-SD: Red blood cell distribution width-standard deviation; WBC: White blood cell.

in patients with herpes zoster, creatinine levels should be checked before acyclovir treatment.

CRP levels are elevated in infectious and inflammatory conditions. Elevated CRP levels in herpes zoster may be an indicator of the severity of the disease and the development of postherpetic neuralgia.[11] As expected, CRP levels were higher in our patients than the values in the control groups.

TABLE 2: Comparison of laboratory values according to the duration of the symptoms.

	Day	n	Mean±SD	Median (Q1-Q3)	p value	Significance
Fasting glucose (mg/dL)	1-5th day[1]	16	125.63±74.35	103 (92.5-120)	[a]0.931	-
	6-10th day[2]	16	108.94±24.52	102.5 (91.75-125.25)		
	11-15th day[3]	5	108.2±17.17	112 (91.5-123)		
BUN (mg/dL)	1-5th day[1]	17	16±6.88	14 (11.5-20.05)	[b]0.324	-
	6-10th day[2]	16	15.09±6.99	13.5 (11.25-16.75)		
	11-15th day[3]	5	20.72±9.32	20 (13.3-28.5)		
Creatinine (mg/dL)	1-5th day[1]	18	0.92±0.29	0.83 (0.73-1.16)	[b]0.679	-
	6-10th day[2]	16	0.94±0.38	0.81 (0.70-1.12)		
	11-15th day[3]	5	1.08±0.51	0.93 (0.77-1.47)		
AST (U/L)	1-5th day[1]	18	22.56±7.52	20.5 (17-29.25)	[b]0.445	-
	6-10th day[2]	16	24.69±7.57	22,5 (18.5-31.5)		
	11-15th day[3]	5	20.2±4.55	22 (15.5-24)		
ALT (U/L)	1-5th day[1]	18	32.67±13.66	28.5 (22-40.75)	[a]0.186	-
	6-10th day[2]	16	35.56±12.1	37 (26.5-41)		
	11-15th day[3]	5	26±6.67	25 (20-32.5)		
ESR (mm/h)	1-5th day[1]	6	18±10.55	16 (8.75-30.25)	[a]0.945	-
	6-10th day[2]	9	19.11±10.78	18 (11.5-28.5)		
	11-15th day[3]	2	22±16.97	22 (10-.)		
Leucocyte (/mm^3)	1-5th day[1]	17	6.8±1.6	6.55 (5.82-7.79)	[b]0.174	-
	6-10th day[2]	17	9.44±5.7	7.71 (6.32-11.38)		
	11-15th day[3]	4	8.03±1.1	7.83 (7.13-9.13)		
Neutrophils (%)	1-5th day[1]	17	55.58±10.3	54.4 (48.45-61.5)	[a]0.347	-
	6-10th day[2]	17	59.58±13.85	60.8 (51.75-66.95)		
	11-15th day[3]	4	59.5±5.49	59.7 (54.1-64.7)		
Lymphocytes (%)	1-5th day[1]	17	29.15±8.48	27.9 (25.6-36.25)	[b]0.639	-
	6-10th day[2]	17	25.38±16.97	23.2 (16.35-32.45)		
	11-15th day[3]	4	30.15±4.35	30.25 (25.9-34.3)		
Monocytes (%)	1-5th day[1]	17	12.41±4.01	12.3 (9.2-15.15)	[a]0.002**	1>2.3
	6-10th day[2]	17	7.91±3.08	6.9 (6.05-9.85)		
	11-15th day[3]	4	7.6±0.5	7.75 (7.08-7.98)		
Eosinophils (%)	1-5th day[1]	17	2.45±1.39	2.3 (1.5-2.95)	[b]0.911	-
	6-10th day[2]	17	2.66±1.54	2.3 (1.25-4)		
	11-15th day[3]	4	2.48±1.49	1.95 (1.43-4.05)		
Basophils (%)	1-5th day[1]	17	0.42±0.24	0.3 (0.25-0.6)	[b]0.442	-
	6-10th day[2]	17	0.35±0.21	0.3 (0.2-0.5)		
	11-15th day[3]	4	0.28±0.13	0.3 (0,15-0,38)		
Neutrophils (/µl)	1-5th day[1]	17	3.81±1.2	3.6 (3.27-4.72)	[b]0.052	-
	6-10th day[2]	17	5.23±2.06	4.77 (3.34-6.98)		
	11-15th day[3]	4	4.82±1.09	4.68 (3.86-5.93)		
Lymphocytes (/µl)	1-5th day[1]	17	1.96±0.7	1.86 (1.48-2.51)	[b]0.180	-
	6-10th day[2]	17	2.4±2.8	2.24 (1.25-2.9)		
	11-15th day[3]	4	2.39±0.11	2.41 (2.27-2.48)		
Monocytes (/µl)	1-5th day[1]	17	0.83±0.27	0.88 (0.56-1.06)	[b]0.175	-
	6-10th day[2]	17	0.68±0.29	0.67 (0.42-0.95)		
	11-15th day[3]	4	0.61±0.11	0.61 (0.51-0.72)		
Eosinophils (/µl)	1-5th day[1]	17	0.16±0.1	0.14 (0.1-0.21)	[a]0.360	-
	6-10th day[2]	17	0.21±0.11	0.23 (0.12-0.27)		
	11-15th day[3]	4	0.19±0.09	0.16 (0.12-0.29)		
Basophils (/µl)	1-5th day[1]	17	0.03±0.02	0.03 (0.01-0.04)	[a]0.740	-
	6-10th day[2]	17	0.03±0.01	0.02 (0.02-0.04)		
	11-15th day[3]	4	0.02±0.01	0.02 (0.01-0.03)		

TABLE 2: Comparison of laboratory values according to the duration of the symptoms *(devamı)*.

	Day	n	Mean±SD	Median (Q1-Q3)	p value	Significance
Hemoglobin (g/dL)	1-5th day[1]	17	13.86±1.54	13.6 (12.8-15.5)	[b]0.207	-
	6-10th day[2]	17	14.17±1.43	14.5 (13.45-15.35)		
	11-15th day[3]	4	12.58±2.37	13.05 (10.15-14.53)		
MCV	1-5th day[1]	17	85.95±4.7	87 (81.8-88.95)	[a]0.982	-
	6-10th day[2]	17	85.94±5.65	86.6 (83-88.35)		
	11-15th day[3]	4	83.93±9.03	86.25 (74.6-90.93)		
RDW-CV	1-5th day[1]	17	14.09±0.69	14.1 (13.55-14.8)	[a]0.336	-
	6-10th day[2]	17	14.24±2.43	13.8 (13-14.55)		
	11-15th day[3]	4	14.03±2.26	13.05 (12.675-16.35)		
Platelet (/µl)	1-5th day[1]	17	208.82±48.47	195 (176.5-243)	[b]0.117	-
	6-10th day[2]	17	249.24±63.64	252 (202.5-27)		
	11-15th day[3]	4	213.5±59.61	205 (161.5-27)		
MPV	1-5th day[1]	17	9.9±0.97	9.7 (9.25-11)	[b]0.552	-
	6-10th day[2]	17	9.78±0.78	9.8 (9.1-10.35)		
	11-15th day[3]	4	10.33±1.06	10.45 (9.25-11.28)		
RBC	1-5th day[1]	17	4.89±0.53	4.76 (4.47-5.37)	[b]0,-.105	-
	6-10th day[2]	17	4.93±0.8	4.86 (4.65-5.24)		
	11-15th day[3]	4	4.39±0.36	4.285 (4.11-4.77)		
Hct	1-5th day[1]	17	41.93±3.87	42.7 (38.95-45.05)	**[b]0.046***	3>1
	6-10th day[2]	17	42.32±3.41	43.6 (40.45-44.65)		
	11-15th day[3]	4	36.9±5.49	38.45 (31.33-40.93)		
MCH	1-5th day[1]	17	28.36±1.55	28.5 (27.05-29.6)	[b]0.869	-
	6-10th day[2]	17	28.74±1.99	29.2 (27.85-30.15)		
	11-15th day[3]	4	28.53±3.82	30.35 (24.68-30.55)		
MCHC	1-5th day[1]	17	33.02±1.26	33.3 (31.85-34.1)	[b]0.336	-
	6-10th day[2]	17	33.45±1.17	33.3 (32.65-34.5)		
	11-15th day[3]	4	33.93±1.7	33.95 (32.3-35.53)		
RDW-SD	1-5th day[1]	17	43.26±3.09	43.4 (39.9-45.95)	[a]0.446	-
	6-10th day[2]	17	43.12±4.47	41.3 (40.9-45.55)		
	11-15th day[3]	4	41±2,.25	41.4 (38.68-42.93)		
PCT	1-5th day[1]	17	0.2±0.03	0.21 (0.18-0.23)	[b]0.081	-
	6-10th day[2]	17	0.24±0.06	0.24 (0.2-0.285)		
	11-15th day[3]	4	0.22±0.04	0.22 (0.18-0.26)		
PDW	1-5th day[1]	17	11.92±2.12	11.4 (10.7-14.2)	[b]0.724	-
	6-10th day[2]	17	11.85±1.65	11.9 (10.5-13)		
	11-15th day[3]	4	12.7±2.12	12.7 (10.65-14.75)		
CRP (mg/dL)	1-5th day[1]	8	3.1±2.82	2.28 (0.47-5.68)	[a]0.296	-
	6-10th day[2]	4	5.9±5.68	4.7 (1.18-11.83)		
	11-15th day[3]	4	1.72±2.65	0.56 (0.16-4.45)		
Ferritin (ng/mL)	1-5th day[1]	6	53.13±45.32	38.50 (15.00-99.45)	[a]0.507	-
	6-10th day[2]	9	93.27±65.67	59 (35.5-160.5)		
	11-15th day[3]	4	123.93±184.85	41.5 (14.775-315.5)		

[1]: 1-5th day; [2]: 6-10th day; [3]: 11-15th day3; [a]: Kruskal Wallis H; [b]: one way ANOVA: *: p<0.05; **: p<0.01; SD: Standard deviation; CRP: C-reactive protein; ESR: Erythrocyte sedimentation rate; Hct: Hematocrit; MCH: Mean corpuscular hemoglobin; MCHC: Mean corpuscular hemoglobin concentration; MCV: Mean corpuscular volume; MPV: Mean platelet volume; PCT: Plateletcrit; PDW: Platelet distribution width; RBC: Red blood cell count; RDW: Red blood cell distribution width; RDW-CV: Red blood cell distribution width-coefficient of variation; RDW-SD: Red blood cell distribution width-standard deviation; WBC: White blood cell.

An MCV >100 fL is considered megaloblastic anemia. A strong and significant relationship has been reported between the development of pediatric herpes zoster and megaloblastic anemia.[12] We could not find any study showing the relationship of MCV elevation or megaloblastic anemia with herpes zoster

in adults. Contrary to this study, we found that MCV values were low in our patients when we compared them with the control groups. We thought that herpes zoster risk factors may be different in children and adults.

Platelets are involved in coagulation, inflammation, and immune response processes. PDW reflects the variability in platelet size and increases due to platelet activation.[13] In an epidemiological study conducted on patients with herpes zoster, lower PDW levels were reported in patients with ophthalmic involvement. Low PDW reflects decreased platelet activation and they said that the platelet pathway may be insufficient in the elimination of viral pathogens.[14] In our study, PDW values were statistically significantly lower in patients with herpes zoster compared to the control groups. Based on our study, we thought that the deficiency in platelet activation might increase the risk of herpes zoster.

In a large meta-analysis conducted in recent years, family history, physical trauma and advanced age were reported as the strongest risk factors among herpes zoster risk factors, while diabetes, cardiovascular diseases, renal disease, rheumatoid arthritis, systemic lupus erythematosus were reported as comorbid diseases leading to increased risk.[15] We detected kidney disease, rheumatological diseases and malignancies more frequently in the herpes zoster patient group with respect to the control group with comorbid disease. We found cardiovascular diseases more frequently in the control group. The frequency of diabetes was similar. We think that especially renal failure is a remarkable risk factor for herpes zoster.

LIMITATIONS

Our study had some limitations: First, our sample size was small. Second, all the laboratory parameters we evaluated were not performed in the entire patient group. Third, serology could not be done for detecting antibodies.

CONCLUSION

During herpes zoster infection, it was determined that there was a slight increase in monocytes and an increase in the CRP levels. Examination of routine laboratory values during diseases may help in diagnosis of the disease, especially in patients with faint clinical signs and zoster sine zoster. In addition, it may be useful to question patients with herpes zoster for renal dysfunction, rheumatological diseases, and malignancy. It would be more beneficial to conduct such studies with a larger number of patients.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Hüsna Güder, Şevin Demir, Semih Güder;* ***Design:*** *Hüsna Güder;* ***Control/Supervision:*** *Hüsna Güder;* ***Data Collection and/or Processing:*** *Hüsna Güder, Şevin Demir, Semih Güder;* ***Analysis and/or Interpretation:*** *Hüsna Güder, Şevin Demir, Semih Güder;* ***Literature Review:*** *Hüsna Güder, Şevin Demir, Semih Güder;* ***Writing the Article:*** *Hüsna Güder, Şevin Demir, Semih Güder;* ***Critical Review:*** *Hüsna Güder, Şevin Demir, Semih Güder;* ***References and Fundings:*** *Hüsna Güder, Şevin Demir;* ***Materials:*** *Hüsna Güder, Şevin Demir.*

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