



Investigating the demographic, clinical, and laboratory characteristics and disease outcomes of patients with Kawasaki disease in Motahhari Hospital of Urmia from 2010 to 2018

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Abstract

Introduction: Kawasaki disease (KD) is a common vasculitis in childhood that is associated with fever and inflammation of vascular tissues of the body, especially in the coronary arteries. The study was aimed to investigate the demographic, clinical, laboratory characteristics and outcome of patients with Kawasaki disease in Shahid Motahhari Hospital in Urmia from 2010-2018.

Materials and Methods: In this cross-sectional study, the medical records of 199 patients admitted to the Pediatric Subspecialty Center of Shahid Motahhari Hospital in Urmia with a diagnosis of Kawasaki for 8 years and underwent diagnostic and therapeutic measures were studied. The data of the studied patients were collected by questionnaires and then the obtained data were analyzed in SPSS-22 software.

Results: The mean age of patients was 34.88 ± 23.94 months, the mean duration of fever was 9.10 ± 4.28 , and the mean length of hospital stay was 6.68 ± 3.29 days and the mean time of onset of IVIG was obtained at 1.77 ± 1.53 days. Overall, 35 patients (17.58%) had a Kawasaki disease outcome, but disease outcome was not reported in 147 (82.42%) patients. Out of all Kawasaki patients, 112 had complete KD symptoms and 87 had incomplete KD symptoms. Also, out of 112 patients with complete KD and 22 out of 87 patients with incomplete KD patients had coronary artery disease. Thirty-five people with a 5-day fever had a disease outcome. The most common clinical symptom was non-purulent conjunctivitis in 102 people and the least clinical symptom was unilateral cervical lymphadenopathy in 66 people.

Conclusion: Clinical symptoms of age, gender, duration of fever, time of onset of IVIG, length of hospital stay, 5-day fever were not significantly associated with clinical outcome. Only leukocytosis and hemoglobin levels had a significant relationship with clinical outcome. There was also no significant relationship between different seasons of the year and the outcomes of Kawasaki disease.

Keywords: Kawasaki diseases, Clinical Characteristics, Laboratory finding.

DOI Number: 10.48047/NQ.2022.20.20.NQ109252

NeuroQuantology2022;20(20): 2548-2555

Introduction

Kawasaki disease, also called mucocutaneous lymph node syndrome, is a type of systemic febrile vasculitis that occurs mainly in children under five years of age. Its etiopathogenesis has not been clarified yet, but it is thought to be a complex interaction of genetic factors, infections, and immunological challenges (1, 2). It causes inflammation of the arteries of body tissues, especially the coronary arteries, and was first reported by a Japanese scientist (3). Kawasaki

disease is diagnosed clinically based on fever for five days or more, with four of the five findings, including bilateral non-purulent bulbar conjunctivitis, inflammation and erythema of the mouth and throat in the form of strawberries, erythema of the throat, edema and erythema of the lips, dry and cracked lips, organ changes (edema and erythema and scaling of the limbs), cervical lymphadenopathy more than 1.5 cm and maculopapular rash, urticaria and erythema multiforme (4). If left untreated, it can result in



various complications such as coronary artery aneurysm, thrombosis, stenosis and even sudden death (5).

Epidemiological patterns are well known in different geographical locations, and its changes vary depending on different ethnicities and seasons. It is found all over the world, but it has been reported more common in Asians and is most prevalent in Japan (239 per 100000), Korea (113.1 per 100000), followed by Taiwan (69 per 100000) (6, 7). Kawasaki disease is mainly seen in young children below 5 years of age and is 1.5 times more common in males to females (8). In a research carried out in Iran in 2014, the incidence of Kawasaki disease in males to females was 1.7 to 1 and the mean age of patients was 2.42 ± 3.36 (9). In cases where there are no complete diagnostic criteria, atypical or incomplete Kawasaki is considered. In this case, the clinical criteria are not complete, so cardiac complications may occur due to lack of timely diagnosis and treatment. Therefore, it is recommended to perform echocardiography in any child with fever for more than 5 days, even if he or she does not meet all the classical diagnostic criteria (10).

Other clinical findings that do not include the classical diagnostic criteria include arthritis, diarrhea, and arrhythmias at the BCG vaccine injection site (11, 12). Other cardiac complications include arterial inflammation, inflammation of the pericardial membrane and fluid accumulation in it, and cardiac arrhythmia, valvular heart disease, and ischemic diseases (12). Appropriate treatment to reduce cardiac complications, especially coronary arteries, is intravenous injection of immunoglobulin and prescription of aspirin, which reduce the incidence of coronary artery disease to less than 5% (13, 14). Since Kawasaki patients do not meet the classical diagnostic criteria in some cases and lack of timely diagnoses and treatment of it leads to complications of the disease and since the agent of this disease is unknown and clinical manifestations and complications are different in different geographical regions and ages (14), and due to the lack of a similar study in this province,

the present study was carried out to investigate the demographic characteristics, clinical and laboratory symptoms and clinical outcomes in patients with Kawasaki in Motahhari Hospital in Urmia.

Materials and Methods

In this cross-sectional analytical study, all patients admitted to the pediatric center of Shahid Motahhari Hospital in Urmia with a diagnosis of Kawasaki for 8 years and underwent diagnostic and therapeutic measures were studied. Based on a questionnaire attached, their information was obtained from the information center of the hospital. The questionnaires were analyzed based on all the required information, including age, gender, residence, season of disease and clinical manifestations, and laboratory findings and its relationship with clinical outcome. Kawasaki disease was diagnosed based on the following criteria: Having fever for 5 days or more with at least 4 symptoms out of 5 symptoms: Bilateral non-purulent bulbar conjunctivitis, inflammation and erythema of the mouth and throat in the form of strawberry, erythema of the throat, edema and erythema of the lips, dry and cracked lips, organ changes (edema and erythema and scaling of limbs), cervical lymphadenopathy greater than 1.5 cm and maculopapular rash. In cases where there were no complete diagnostic criteria, atypical or incomplete Kawasaki was suggested. In the cases that clinical criteria were not met and no cause was found for the fever for 5 days or more along with 2 or 3 of the above-mentioned criteria, the diagnosis of atypical Kawasaki was suggested. The data collection tool included pre-prepared checklists. The data obtained in this study were analyzed using SPSS-22 software.

Findings

The results of the present study revealed that the mean age of patients was 34.88 ± 23.94 months, the mean duration of fever was 9.10 ± 4.28 and the mean length of hospital stay was 6.68 ± 3.29 days. Among the patients studied, 89 were female and 110 were male, 155 were living in urban area and 44 were living in rural areas. Also, 53 referred in spring, 44 in summer, 42 in autumn



and 60 in winter (Table 1). Overall, 35 (17.58%) had Kawasaki disease outcome and 147 (82.42%) had no disease outcome. Out of all Kawasaki patients, 112 had complete KD symptoms and 87 had incomplete KD symptoms. Also, out of 112 patients with complete KD and 22 out of 87 patients with incomplete KD patients had coronary artery disease. Regarding the disease outcome, increased brightness around the

coronary artery was found in 15 patients, only coronary artery aneurysm was found in 7 patients and only coronary artery dilatation was found in 6 patients. Also, in 1 patient, both increased brightness and coronary artery dilatation were reported, and in 5 patients, both coronary artery dilatation and coronary artery aneurysm were reported.

Table 1- Season, residence and gender of patients studied

Residence			Season				Total
			Spring	Summer	Autumn	Winter	
Urban	Gender	Male	21	16	20	25	82
		Female	18	19	16	20	73
	Total	39	36	36	45	155	
Rural	Gender	Male	9	6	4	9	28
		Female	5	3	2	6	16
	Total	14	9	6	15	44	
Total	Gender	Male	30	22	24	34	110
		Female	23	22	18	26	89
	Total	53	44	42	60	199	

Out of 199 medical records of Kawasaki patients in Motahhari Hospital in Urmia in 2018-2010, 7 patients referred in spring, 9 patients in summer, 7 patients in autumn and 12 patients in winter and 46 people had Kawasaki disease outcomes in the spring, 35 in the summer, 35 in the autumn, and 48 in the winter. There was no significant relationship between different seasons of the year and the outcomes of Kawasaki disease ($P = 0.745$). Also, in this study, the mean age of people who had disease outcomes was 32.28 ± 21.61 months and the mean age of people who did not have disease outcomes was 76 ± 24.73 months. In the age group 1 (below 12 months), 9 patients, in the age group 2, (13 to 24 months) 12 patients, in the age group 3 (25 to 36 months), 3 patients, in the age group 4 (37 to 48 months), 5 patients, in the age group 5 (49 to 60 months), 3

patients, in the age group 6 (61 to 72 months), 1 patient, in the age group 7 (73 to 84 months), 1 patient, and in the age group 8 (85 to 96 months), 1 patient and a total of 35 people had clinical outcome.

Also, in the age group 1 (below 12 months), 29 patients, in the age group 2 (13 to 24 months), 47 patients, in the age group 3 (25 to 36 months), 26 patients, in the age group 4 (37 to 48 months), 9 patients, in the age group 5 (49 to 60 months), 33 patients, in the age group 6 (61 to 72 months), 10 patients, in the age group 7 (73 to 84 months), 4 patients, and in the age group 8 (85 to 96 months), 16 patients and a total of 164 people did not have clinical outcome. There was no significant relationship between age and the Kawasaki disease outcomes ($P = 0.176$).



Regarding the gender of the patients, 20 males and 15 females had disease outcome and 90 males and 74 females had no disease outcome. No significant relationship was found between the gender and the Kawasaki disease outcomes ($P = 0.807$). Also, out of 199 cases of patients with Kawasaki disease, 26 living in urban areas and 9 living in rural areas had disease outcomes and 129 living in urban and 35 living in rural areas did not have disease outcomes. There was no significant relationship between age and the outcomes of Kawasaki disease ($P = 0.847$). The mean duration of fever in people with disease outcome was 10 ± 4.69 days and the mean duration of fever in people without disease outcome was 9.91 ± 4.18 days. There was no significant relationship between the duration of fever and the outcomes of Kawasaki disease ($P = 0.111$). The mean length of hospital stay in patients who had a disease outcome was 7.74 ± 4.58 days and the mean length of hospital stay of those who did not have a disease outcome was 6.45 ± 2.91 days.

There was no significant relationship between the length of hospital stay and the outcomes of Kawasaki disease ($P = 0.377$). The mean time of onset of IVIG was 1.77 ± 1.53 days in those who had disease outcome and 1.85 ± 1.65 days in those who did not have disease outcome. No significant relationship was reported between the onset of IVIG and the outcomes of Kawasaki disease ($P = 0.487$). Out of the total number of medical records reviewed, 35 with 5-day fever had disease outcome, 5 without 5-day fever had no disease outcome, and 159 with a 5-day fever had no disease outcome. There was no significant relationship between 5-day fever and the outcomes of Kawasaki disease ($P = 0.295$). Also, 17 people with maculopapular rash and 18 people without maculopapular rash had disease outcome and 69 people with maculopapular rash and 95 people without maculopapular rash did not have disease outcome, and a total of 86 people had maculopapular rash and 113 people did not have maculopapular rash. No significant

relationship was reported between maculopapular rash and Kawasaki disease outcomes ($P = 0.481$).

Out of the 199 cases of Kawasaki patients, 19 with non-purulent conjunctivitis and 16 without non-purulent conjunctivitis had disease outcome, 83 without non-purulent conjunctivitis and 81 without non-purulent conjunctivitis had no disease outcome, and a total of 102 had non-purulent conjunctivitis and 97 had no non-purulent conjunctivitis. There was no significant relationship between non-purulent conjunctivitis and the outcomes of Kawasaki disease ($P = 0.693$). Also, 21 people with changes in the lips and 14 people without changes in the lips had disease outcome and 77 people with changes in the lips and 78 people without changes in the lips did not have disease outcome, and a total of 98 people had changes in the lips and 101 people did not have changes in the lips. There was no significant relationship between changes in the lips and the Kawasaki disease outcomes ($P = 0.161$).

Also, 13 people with strawberry tongue and 22 people without strawberry tongue had disease outcomes and 61 people with strawberry tongue and 103 people without strawberry tongue had no disease outcome and in total 74 people had strawberry tongue and 125 people did not have strawberry tongue. No significant relationship was observed between strawberry tongue and Kawasaki disease outcomes ($P = 0.995$). The results of this study revealed that 15 people with skin erythema and scaling of the fingers and 20 people without skin erythema and scaling of the fingers have a disease outcome, 39 people with skin erythema and scaling of the fingers and 125 people without skin erythema and scaling of fingers had no disease outcome and a total of 54 patients had skin erythema and scaling of the fingers and 145 people did not have erythema and scaling of the fingers (Table 2). A significant relationship was reported between skin erythema and scaling of fingers and the outcomes of Kawasaki disease ($P = 0.021$).

Table 2- Skin erythema and scaling of the fingers and clinical outcome in the studied patients



			Skin erythema and scaling of the fingers		Total
			Yes	No	
Clinical outcome	Yes	f	15	20	35
		%	7.5%	10.1%	17.6%
	No	f	39	125	164
		%	19.6%	62.8%	82.4%
Total		f	54	145	199
		%	27.1%	72.9%	100.0%

Out of the 199 medical records studied in Kawasaki patients, 11 with unilateral cervical lymphadenopathy and 24 without unilateral cervical lymphadenopathy had disease outcome, 55 with unilateral cervical lymphadenopathy and 109 without unilateral cervical lymphadenopathy did not have disease outcome. A total of 66 patients had unilateral cervical lymphadenopathy and 133 patients did not have unilateral cervical lymphadenopathy. No significant relationship was reported between unilateral cervical lymphadenopathy and the outcomes of Kawasaki disease (P = 0.811).

separately. The results of this study revealed that only the level of leukocytosis and the level of hemoglobin had a significant relationship with the clinical outcome and the level of neutrophils, lymphocytes, Plt, ESR and CRP had no significant relationship (Table 4).

Table 3 presents the mean of laboratory findings

Table 3- Mean laboratory findings in the present study

	leukocytosis	Neutrophils	Lymphocytes	Hemoglobin level	Plt	ESR	CRP
Mean	13742.61	58.85	32.40	10.25	408974.87	77.49	42.50
Min	3680	7	5	7.40	44000	5	1
Max	13806	91	78	15.4	1327000	135	136

Table 4- Comparison of mean laboratory findings

CRP	ESR	Plt	Hemoglobin level	Lymphocytes	Neutrophils	leukocytosis	
0.852	0.207	0.564	.08	0.811	0.777	0.03	P value

Out of the 199 cases reviewed by patients with Kawasaki disease, 13 were not studied due to incomplete medical records. Also, 13 patients with sterile pyuria and 20 patients without sterile pyuria had disease outcome, 29 patients with

sterile pyuria and 124 patients without sterile pyuria did not have disease outcome, and a total of 45 patients had sterile pyuria and 153 patients did not have sterile pyuria. No significant relationship was observed between sterile pyuria



and Kawasaki disease outcomes (P = 0.011).

Also, 17 with checked Alb, 32 with checked AST, and 32 with checked ALT had clinical outcome, and 35 Alb, 20 AST, 20 ALT, unchecked test had clinical outcome, and 45 with checked 5 Alb, 72 with checked AST, 72 with checked ALT, and 102 with non-checked Alb, 75 with non-checked AST, 75 with non-checked ALT had no clinical

outcome. The mean level of ALB, AST and ALT levels are given in Table 5 separately. Examination of the results showed that there was a significant relationship between people whose Alb level was checked (P = 0.046), but in the patients whose AST and ALT levels were checked, there was no significant relationship in this regard (P = 0.087 and P = 0.844, respectively).

Table 5- ALB, AST and ALT levels and disease outcomes

ALB, AST and ALT* levels and disease outcomes							
				Alb	AST	ALT	
Clinical outcome	Yes	f	Checked test	17	32	32	
			Non-checked test	35	20	20	
		Mean			3.44	34.78	35.28
		SD			0.49	40.65	33.65
		Min			2.30	15	6
		Max			4.30	246	155
		No	f	Checked test	45	72	72
	Non-checked test			102	75	75	
	Mean			14.95	53.01	66.13	
	SD			53.68	73.28	108.30	
	Min			2.80	11.00	6	
	Max			305	432.00	674	

Discussion

About half a century ago, Dr. Tomisaku Kawasaki reported 50 cases of Kawasaki disease in 1967, and since then the disease has spread rapidly in various countries. However, the cause and risk factors of this disease are still unclear (15, 16, 17). Lack of timely diagnosis and treatment of this disease causes many complications in these patients, and even leads to their death in some cases. Since the cause of this disease is unknown and clinical manifestations and complications are different in geographical areas and different ages

and races (14, 18) and due to the lack of a similar research in the study area, the present study was conducted to evaluate the demographic characteristics, clinical and laboratory symptoms and clinical outcomes in Kawasaki patients at Motahhari Hospital in Urmia. In this study, the mean age of patients was 34.88 ± 23.94 months, the mean duration of fever was 9.10 ± 4.28 and the mean length of hospital stay was 6.68 ± 3.29 days.

A total of 35 people had Kawasaki disease outcomes and 147 had no disease outcomes. Out of the total number of Kawasaki patients, 112



had complete KD symptoms and 87 had incomplete KD symptoms. Also, 13 out of 112 patients with complete KD and 22 out of 87 patients with incomplete KD had coronary artery disease. In a similar research carried out by Sadighi et al. in Iran, they reported that out of all cases, 44 (59.5%) had a complete Kawasaki diagnosis and 30 patients (40.5%) had an incomplete Kawasaki diagnosis. Among the patients treated timely, 11 (14.8%) coronary aneurysms were observed. However, scaling of the fingers was less common and the most common laboratory criteria were leukocytosis, thrombocytosis and anemia, which were measured by complete blood count. Coronary artery aneurysms were more common in patients treated timely than in other studies, which may require reconsideration of the golden time to begin treatment (14).

In the present study, the mean length of hospital stay of patients who had a disease outcome was 7.74 ± 4.58 days and the mean length of hospital stay of people who did not have a disease outcome was 6.45 ± 2.91 days. Also, the mean onset time of IVIG in patients with disease outcome was 1.77 ± 1.53 days and the mean onset time of IVIG in patients without disease outcome was 1.85 ± 1.65 days. Also, 35 patients with 5-day fever had disease outcomes and 5 patients without 5-day fever and a total of 159 patients with 5-day fever did not have disease outcomes. The most common clinical symptom was non-purulent conjunctivitis observed in 102 patients and the least common clinical symptom was unilateral cervical lymphadenopathy observed in 66 patients. This result was similar to the result of a research carried out by Sadighi et al. in 2013 (14) in Iran. In the research conducted by Sadighi et al., conjunctivitis was considered as the most common clinical finding, which was manifested in 79% of patients. However, peripheral erythema was less than usual, and it was reported in 23% of cases and leukocytosis was observed in 49.3% and scaling of fingers was observed in 54% of patients.

These results were inconsistent with those of research conducted by Fukushige et al. In that

study, aimed to evaluate the incidence and clinical manifestations in Kawasaki patients, the results showed the symptoms of cervical lymphadenopathy and polymorphic exanthema in patients. Laboratory characteristics of Kawasaki disease such as increased ESR, leukocytosis, anemia, CRP positive and thrombocytosis were also reported in incomplete cases. In 1 case (4%), temporary coronary artery dilatation was identified (19). None of the clinical symptoms of age, gender, duration of fever, time of onset of IVIG, length of hospital stay and 5-day fever showed significant relationship with clinical outcome and only the leukocytosis and hemoglobin levels showed a significant relationship with clinical outcome, which was similar to the results of studies conducted by Kang et al. (20) and Shamsizadeh et al. (9).

In a study conducted by Kang et al. (20) in South Korea in 2013, medical records for information on signs and symptoms, demographic characteristics, and laboratory and echocardiographic findings related to KD were reviewed and no significant difference was found in the duration of the fever phase, length of hospital stay, recurrence and dose of intravenous immunoglobulin (20). In another research carried out by Shamsizadeh et al. (2014) in Ahvaz, clinical manifestations and laboratory findings in Kawasaki patients were examined and a statistically significant difference was not found between cardiac and non-cardiac groups and age, gender, clinical manifestations, and laboratory findings and cessation of fever and patients with heart disorders showed longer hospital stay (9).

Conclusion

In general, the results of the present study showed that the clinical symptoms of age, gender, duration of fever, time of onset of IVIG, length of hospital stay and 5-day fever were not significantly associated with clinical outcome. Only leukocytosis and hemoglobin levels had a significant relationship with clinical outcome. Also, no significant relationship was reported between different seasons of the year and the outcomes of Kawasaki disease.



References

1. Agarwal S, Agrawal DK. Kawasaki disease: etiopathogenesis and novel treatment strategies. *Expert Rev Clin Immunol*. 2017; 13(3):247-258. doi: 10.1080/1744666X.2017.1232165.
2. Kontopoulou T, Kontopoulou DG, Vaidakis E, Mousoulis GP. Adult Kawasaki disease in a European patient: a case report and review of literature. *J Med Case Rep*. 2015; 9:75.
3. Sundel RP. Kawasaki disease. *Rheum Dis Clin North Am*. 2015; 41(1):63-73, viii. doi: 10.1016/j.rdc.2014.09.010.
4. Saguil A, Fargo M, Grogan S. Diagnosis and management of Kawasaki disease. *Am Fam Physician*. 2015; 91(6):365-71.
5. Guo MMH, Tseng WN, Ko CH, Pan HM, Hsieh KS, Kuo HC. Th17- and Treg-related cytokine and mRNA expression are associated with acute and resolving Kawasaki disease. *Allergy*. 2015; 70(3):310-8.
6. Greco A, De Virgilio A, Rizzo MI, Tombolini M, Gallo A, Fusconi M, et al. *Autoimmun Rev*. 8. Vol. 14. Elsevier B.V; 2015. Kawasaki disease: An evolving paradigm; pp. 703-9. Internet. Available from: <http://dx.doi.org/10.1016/j.autrev.2015.04.002>.
7. Darby JB, Tamaskar N, Kumar S, Sexson K, de Guzman M, Rocha MEM, Shulman ST. Variability in Kawasaki Disease Practice Patterns: A Survey of Hospitalists at Pediatric Hospital Medicine 2017. *Hosp Pediatr*. 2019; 9(9):724-728. doi: 10.1542/hpeds.2019-0013.
8. Singh S, Vignesh P, Burgner D. The epidemiology of Kawasaki disease: a global update. *Arch Dis Child*. 2015; 100(11):1084-8.
9. Shamsizadeh A, Ziaei Kajbaf T, Razavi M, Cheraghian B. Clinical and epidemiological characteristics of Kawasaki disease. *Jundishapur journal of microbiology*. 2014; 7(8):e11014.
10. Royle J, Burgner D, Curtis N. The diagnosis and management of Kawasaki disease. *Journal of paediatrics and child health*. 2005; 41(3):87-93.
11. Freeman AF, Shulman ST. Kawasaki disease: summary of the American Heart Association guidelines. *American family physician*. 2006; 74(7):1141-8.
12. Ichida F, Fatica NS, Engle MA, O'Loughlin JE, Klein AA, Snyder MS, et al. coronary artery involvement in Kawasaki syndrome in Manhattan, New York, Risk factors and role of aspirin, 1987; 80(6):825.
13. McCrindle B. Pediatric Heart Network Investigators. Coronary artery involvement in children with Kawasaki disease. Risk factors from analysis of serial normalized measurements. *Circulation*. 2007; 116:174-9.
14. Sedighi I, Biglari M, Olfat M, Yadollahi H, Tanasan A, Torabian S. Clinical Characteristics and Outcomes of Iranian Patients With Kawasaki. *J Compr Pediatr*. 2014; 5(1):e13971.
15. Nakamura Y. Kawasaki disease: epidemiology and the lessons from it. *Int J Rheum Dis*. 2018; 21(1):16-19. doi: 10.1111/1756-185X.13211.
16. Kim GB. Reality of Kawasaki disease epidemiology. *Korean J Pediatr*. 2019; 62(8):292-296. doi: 10.3345/kjp.2019.00157.
17. Arslanoglu Aydin E, Ertugrul I, Bilginer Y, Batu ED, Sonmez HE, Demir S, Arici ZS, Sag E, Alehan D, Ozen S. The factors affecting the disease course in Kawasaki disease. *Rheumatol Int*. 2019; 39(8):1343-1349. doi: 10.1007/s00296-019-04336-2.
18. Woo HO. Predictive risk factors of coronary artery aneurysms in Kawasaki disease. *Korean J Pediatr*. 2019; 62(4):124-125. doi: 10.3345/kjp.2019.00073.
19. Fukushige J, Takahashi N, Ueda Y, Ueda K. Incidence and clinical features of incomplete Kawasaki disease. *Acta Paediatrica*. 1994; 83(10):1057-60.
20. Kang HJ, Kim GN, Kil HR. Changes of clinical characteristics and outcomes in patients with Kawasaki disease over the past 7 years in a single center study. *Korean journal of pediatrics*. 2013; 56(9):389-95.

