DISEASE CHARACTERISTICS AND LENGTH OF HOSPITAL STAY IN CHILDREN WITH ACUTE RHEUMATIC FEVER

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ABSTRACT

Attack of acute rheumatic fever (ARF) are often severely unwell, in great pain, with severe carditis and requirement of hospitalization. Length of hospital stay in ARF patients usually depend on the severity of the disease. Relationship between disease characteristic and length of stay especially in children is usually unknown. The aim of this study is to determine the relationship of disease characteristics and length of hospital stay in children with ARF in Sanglah Hospital. Using inpatient medical record, we identified all patients with acute rheumatic fever from January 2016 until May 2019. *Independent T-test* was used to assess for statistical significance and a p-value less than 0.05 was considered significant. A total of 41 patients were admitted with primary diagnosis of acute rheumatic fever and registered in Sanglah Hospital from January 2016 until May 2019; the mean of age was 11.41 (SD 3.33) years old and 63.4% were male. Median length of stay was 6.0 (0-36) days. Severe carditis, recurrent ARF attack, and comorbidity has a significant mean difference of length of stay [(25 vs 16; p=0.021); (29 vs. 16, p=0.001), (37 vs. 17, p=0.001) days] respectively. Severe carditis, recurrent attacks of ARF, comorbid were an important factor associated with longer hospital stay.

Keywords: *Acute Rheumatic Fever, Length of stay, Carditis*

INTRODUCTION

Acute rheumatic fever (ARF) is thought to be an auto-immune consequence of infection with the bacterium group A streptococcus (GAS). It causes an acute generalized inflammatory response and an illness that affects only certain parts of the body, mainly the heart, joints, brain and skin. Individuals with ARF are often severely unwell, in great pain and require hospitalization (Heart Foundation, 2014). In 2015, Indonesia ranks fourth in countries with the largest estimated number of RHD cases. The five countries with the most RHD cases were India (13.17 million), China (7.07 million), Pakistan (2.25 million), Indonesia (1.18 million) and the Democratic Republic of the Congo (805,000) (Watkins dkk, 2017).

Rheumatic heart disease is the only clinical manifestation of rheumatic fever (RF) which results in residual or permanent damage occurring in 14 to 99% patients. Acute rheumatic fever follows 0.3% of cases of group A beta-hemolytic streptococcal pharyngitis in children . As many as 39% of patients with acute rheumatic fever may develop varying degrees of pancarditis with associated valve insufficiency, heart failure, pericarditis, and even death. With chronic rheumatic heart disease, patients develop valve stenosis with varying degrees of regurgitation, atrial dilation, arrhythmias, and ventricular dysfunction. Rheumatic heart disease was the leading cause of death 100 years ago in people aged 5-20 years in the United States, incidence of this disease has decreased in developed countries, and the mortality rate has dropped to just above 0% since the 1960s (WHO, 2004)

Miyake et al in 2006 found that hospitalizations for acute rheumatic fever were infrequent and varied according to race, season, location, and type of hospital. The median length of stay for acute rheumatic fever hospitalizations was 3 days (range: 1–41 days; interquartile range: 2–5 days), and in-hospital mortality rate was 0.6%. In Sanglah Hospital, acute rheumatic fever length of stay based on pediatric department clinical guideline is ranged from 7-14 days and in several cases found that ARF hospitalizations longer than 14 days. Because reported hospitalization rates for children diagnosed as having ARF may vary between 4% and 50% (Watkins dkk, 2017 & Miyake dkk, 2007) and it is likely that socioeconomic, demographic, and local hospital factors influence the decision to hospitalize a child with ARF, we compared characteristics of ARF hospitalizations with length of stay.

METHODS

This is a retrospective analytical research to describe the relationship between the characteristics of acute rheumatic fever patient and the length of hospital stay. Variables studied in this research including arthritis/polyarthritis, severe carditis, recurrence, and length of hospital stay.

Sample size is measured by rule of thumb, which uses 10 times the number of variables. Because this study uses four variables, the minimum sample size of this study is 40 samples. The sample of this research is taken in Sanglah Hospital, using medical record from January 2016 until May 2019.

The subject off this study is 5-18 years old children with acute rheumatic fever in Sanglah Hospital during this study period. Inclusion criteria is children 5-18 years old and diagnosed with acute

rheumatic fever. Exclusion criteria is incomplete medical record.

The operational definition of variables in this study, as follows:

1. Acute rheumatic fever define as a clinical syndrome after Group A β-hemolytic streptococci infection according to revised Jones 2015 criteria, with 2 major signs, or 1 major accompanied by 2 minor, accompanied by previous GABHS infection.
2. Age is chronological age while recruited as sample. Age measured by date, month, and year of birth. This variable is presented in numerical data.
3. Sex is determined based on fenotype. This variable is presented in cathegorical data, divided in two groups, (1) male and (2) female.
4. Comorbidities define as the presence of one or more additional conditions co-occurring with (that is, concomitant or concurrent with) a primary condition. Comorbidities in this study is infective endocarditis, nosocomial infection and complications such as cordae rupture, arrythmia, and severe anemia.
5. Arthritis define as swelling of the joints accompanied by two or more of the following attacks: restriction of movement, feeling of heat in the joints and pain in the joints. This variable is presented in cathegorical data, divided in two groups, (1) without arthritis and (2) with arthritis.
6. Carditis is the inflammation of the heart confirmed by echocardiography. This variable is presented in categorical data (1) without carditis and (2) with carditis.
7. Recurrence define as a clinical syndrome after Group A β-hemolytic streptococci infection according to revised Jones 2015 criteria with 2 major manifestations or 1 major plus 2 minor manifestations or 3 minor manifestations. This variable is presented in cathegorical data, divided in two groups, (1) first episode and (2) recurrent.
8. Infective endocarditis is microbial infection on the surface of endocardium (endothel). This variable is presented in categorical data (1) without infective endocarditis and (2) with infective endocarditis.
9. Nosocomial infection is an infection that is acquired in a hospital or other health care facility. This variable is presented in categorical data (1) without nosocomial infection and (2) with nosocomial infection.
10. Rupture of the chordae is suggested by the sudden appearance of a loud precordial systolic murmur, maximal at the apex and left sternal border, where it is usually accompanied by a thrill. Confirmed by echocardiography. This variable is presented in categorical data (1) without cordae rupture and (2) with cordae rupture.
11. Arrythmia is a disorder of the heart that affects the rate or rhythm at which the heart beats. An arrhythmia occurs when electrical impulses, which direct and regulate heartbeats, don't function properly. Confirmed by electrocardiography. This variable is presented in categorical data (1) without arrythmia and (2) with arrythmia.
12. Severe anemia is a reduction in the number of circulating red blood cells (RBCs), the amount of hemoglobin is below 6 mg/dL in complete blood count test. This variable is presented in categorical data (1) without severe anemia and (2) with severe anemia .

Instruments used in this study is form to record variables studied in this research, including identity, sex, date of birth, age, diagnosis, arthritis/polyarthritis, severe carditis, recurrence, and length of hospital stay. This research used secondary data from Sanglah Hospital medical records of acute rheumatic fever patients admitted from January 2016 until May 2019. Case which met inclusion and exclusion criterias is accepted as sample by consecutive sampling until the sample size requirement was fulfilled.

Collected data is analyzed using SPSS for Windows 24.0 version. Data analysis in this research including:

1. Descriptive analysis to describe the samples characteristics in each study group. Continous data is presented in mean and deviation standard if normally distributed, or median and range if not normally distributed. Cathegorical data will be presented in percentage.
2. Analysis to compare the patient characteristics and length of hospital stay using independent T-test. The effect size is presented in percentage. P-value of less than 0.05 was considered statistically significant for these study data analyses, with 95% confidence interval.

RESULTS

A total of 41 cases of acute rheumatic fever were registered in Sanglah Hospital from January 2016 until May 2019. The ARF patients mean of age is 11.41 (3.33) years, 26 males (63.4%) were included. Arthritis was present in 16 patients (39%), severe carditis in 24 patients (58.5%) and recurrence in 16 patients (39%). The baseline characteristic of the patients is shown in Table 1.

Table 1. Subject Characteristic

Parameter	Values
Age, mean (SD), years	11.41(3.33)
Sex, n (%)	
Male	26 (63.4)
Female	15 (36,6)
Height, median (range), cm	135 (103-175)
Body weight, median (range), kg	34 (15-93)
BMI, median (range), kg/m^2	17.6 (12.2-36.2)
Arthritis, yes, n (%)	16 (39.0)
Severe carditis	24 (58.5)
Recurrence	
First case yes, n (%)	25 (61.0)
Recurrent yes, n (%)	16 (39)
Length of stay, median (range), days	6 (0-36)

We studied which characteristic of acute rheumatic fever that affects the patient length of stay. Within 4 characteristic, only severe carditis and recurrence significantly affect the length of stay with mean 25; p=0,021 and 29; p=0,001 days respectively, but not arthritis (mean 20, p=0,43). The data is shown in table 2. Comorbidities was found in 9 patients (22%) with nosocomial infection and none of the patients have complication such as cordae rupture, arrythmia, or severe anemia.

Table 2. Length of stay compared between characteristic of acute rheumatic fever

Parameter		Length of Stay	
		Mean	*p*
Arthritis	No (n=25)	23	0,43
	Yes (n=16)	20	
Severe carditis	No (n=17)	16	0,021
	Yes (n=24)	25	
Recurrence	No (n=25)	16	0,001
	Yes (n=16)	29	
Comorbidity	No (n=32)	17	0,001
	Yes (n=9)	37	

According to pediatric department clinical practice in Sanglah Hospital, ARF should be admitted for 7-14 days, but the bed rest is depending on the severity of the disease. Bed rest didn't have to be in the hospital, but if the complaints of the disease still persist or there's complication, length of stay in the hospital can be prolong . ARF with arthritis should bed rest for 7-14 days, ARF with severe carditis for 3-4 months, and bed rest for recurrence ARF depend on the severity of the disease (PPK IKA, 2017).

Arthritis was present in 16 of our patients (39%), severe carditis in 24 patients (58,5%) and recurrence in 16 patients (39%). The median length of stay of our patients was 6 days varying from out patient only to 36 days as the longest. It is still within the range of acute rheumatic fever length of stay based on pediatric department clinical practice which ranged from 7-14 days in Sanglah Hospital (PPK IKA, 2017).

Within 4 characteristic, severe carditis, comorbidity, and recurrence significantly affect the length of stay with mean 25; p=0,021: 37; p=0,001: and 29; p=0,001 days respectively, but not arthritis (mean 20, p=0,43). The most frequently found comorbidities were nosocomial infection found in 9 patients (22%), and none of the patients have complication such as cordae rupture, arrythmia, or severe anemia. Study by Miyake et al found the median length of stay for acute rheumatic fever hospitalizations was 3 days (range: 1–41 days; interquartile range: 2–5 days) but their study is not showing length of stay by disease characteristic (Miyake dkk, 2007).

Carditis is the most serious manifestation of ARF because it can lead to chronic rheumatic heart disease, while all other clinical features of ARF fully resolve, often within weeks (Sika dkk, 2017). More severe degrees of carditis and significant valvar sequels presented a higher prevalence in patients with recurrence ARF that make the hospitalization longer than first ARF (Mota dkk, 2015). Nosocomial infection such as hospital acquired pneumonia, is one of the comorbidity in ARF, defined as any case of lung infection occurring in a patient within 48 hours after hospitalized. For hospital acquired pneumonia usually given antibiotic for 7-14 days.

In this study there is limitation such as several confounding factors may have contributed to the relationship between ARF and prolonged hospitali¬zation, including the need of anticoagulation therapy, critically ill patients or some other factors . In addition, we cannot provide follow-up data after discharge for patients hospitalized with ARF . Subsequent studies will be warranted to define the role of rheumatic etiology as a risk factor for length of stay regardless of these comorbidities.

CONCLUSIONS

This study highlights the importance of characteristic of the disease as a contributing factor for prolonged hospital in acute rheumatic fever patient. Severe carditis, recurrence, and comorbidities but not arthritis may play role in longer hospital stay.

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REFERENCES

Garcia AF, Yamaga KM, Shafer LA, et al . Cardiac myosin epitopes recognized by autoantibody in acute and convalescent rheumatic fever. Pediatr Infect Dis J. 2016;35(9):1021-1026 .

Heart Foundation of New Zealand. New zealand guidelines for rheumatic fever: diagnosis, management and secondary prevention of acute rheumatic fever and rheumatic heart disease: 2014. Available at: www.heartfoundation.org.nz

Miyake CY, Gauvreau K, Tani LY, Sundel RP, Newburger JW. Characteristics of children discharged from hospitals in the united states in 2000 with the diagnosis of acute rheumatic fever. Pediatrics;2007:120:503.

Mota CC, Meira ZM, Graciano RN, Graciano FF, Araujo FD. Rheumatic fever prevention program: long-term evolution and outcomes. Frontiers in Pediatrics . 2015; 2:1-5.

Panduan Praktik Klinis Ilmu Kesehatan Anak (PPK IKA). Demam rematik & penyakit jantung rematik. Universitas Udayana. 2017; 323 -9.

Parks T, Smeesters PR, Steer AC. Streptococcal skin infection and rheumatic heart disease. Curr Opin Infect Dis. 2012;25(2):145-53.

Sika-paotonu D, Beaton A, Raghu A, et al. Acute rheumatic fever and rheumatic heart disease. NCBI Books . 2017;1-57.

Watkins DA, Catherine OJ, Samantha MC, Ganesan K, Andrea B, Gene, et al . Global, regional, and national burden of rheumatic heart disease 1990-2015. The New England Journal of Medicine. 2017;377:713-722 .

Wolfe RR. Incidence of acute rheumatic fever: a persistent dilemma. Pediatrics. 2000;105:1375.

World Health Organization (WHO). Rheumatic fever and rheumatic heart disease: Report of a WHO Expert Consultation, Geneva 29 October-1 November 2001, Switzerland: WHO 2004. Available from www.who.int/cardiovasculardiseases/publications/trs923/en