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Characteristics, Management, and Mortality Differences in Pediatric Patients with Pleural Effusion Before and During the COVID-19 Pandemic

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Keywords
Pediatric Pleural Effusion; Covid-19 Pandemic; Mortality; LDH Level; Management

ABSTRACT
The research aims to determine the differences in characteristics, management, and mortality of pediatric patients with pleural effusion before and during the Covid-19 pandemic; A cross-sectional study of 60 patient from February 2018 to March 2022 at RSUP. Dr. M. Djamil Padang, obtained through random sampling. Data analyse using univariate and bivariate, with bivariate analysis using Chi-square Test with significance at p <0.05; Results: Out of 60 samples, an increased number of patients aged 2-5 years during the Covid-19 pandemic (23.3%) was found, complaints before hospital admission >4 weeks were higher before Covid-19 at 23.3% (p <0.05), LDH levels in pleural effusion fluid during Covid-19 were higher at 5,277 + 10,664 (p <0.05). Staphylococcus aureus from blood cultures was higher during Covid-19 (16.7%). The use of CPAP before and during Covid-19 was 20% vs 16.7%, and ventilator use was 33.3% vs 36.7%, the most commonly used antibiotics were Ampicillin (63.3% vs 46.7%) and Gentamicin (50.0% vs 33.3%). Patient mortality was higher during Covid-19 (36.7%), although not statistically significant (p> 0.05); There were significant differences in the duration of complaints before hospital admission and LDH levels in pleural effusion fluid, but the management and mortality did not show significant differences.

INTRODUCTION

Pleural effusion defines as the accumulation of fluid between the parietal and visceral pleura. This can be caused by various factors such as infection, malignancy, or inflammatory conditions. Pleural effusion is a major cause of morbidity and mortality in pulmonary diseases. The most common causes of pleural effusion in children are infection (50-70%), congestive heart failure (5-15%), and malignancy (10-15%) (Karkhanis & Joshi, 2012).

Staphylococcus aureus found as the most common causative macrobacterium of infectious pleural effusion, which account for 29-35% of cases. These bacteria often affecting children under 2 years old. Other bacteria such as Streptococcus pneumoniae account for 25% of pleural effusion cases, while Haemophilus influenzae often infects children over 5 years old. These bacteria are anaerobic in nature, including Microaerophilic streptococci, Fusobacterium nucleatum, and Bacteroides melaninogenicus (Goyal et al., 2014).

Pleural effusion could occur due to infection such as in pneumonia, lung abscess, or bronchiectasis. Based on the type of fluid, pleural effusion is categorized as exudative or transudative. Transudative pleural effusion is caused by congestive heart failure, liver cirrhosis, nephrotic syndrome, and pulmonary embolism, while exudative pleural effusion is caused by infection or other diseases leading to secondary infection. The majority of pleural effusions are caused by bacterial infections (Jany & Welte, 2019; Rostad et al., 2021).

The prevalence of pleural effusion is estimated at 320 cases per 100,000 population in developed countries. In the United States, the incidence of pleural effusion reaches 1.5 million new cases per year (Adeoye et al., 2017; Beers & Abramo, 2007). The result of a meta-analysis indicating an increase in the prevalence of pleural effusion to 9.55%, followed by an increase in severity and mortality of patients with COVID-19 (Cappelli et al., 2023). Other study also found an increase in the incidence of pleural effusion in children during the COVID-19 pandemic (Rostad et al., 2021).

The COVID-19 pandemic is a widespread outbreak of COVID-19 that affecting a large geographical area. It is a situation where the disease has spread rapidly worldwide and affects populations globally. The COVID-19 pandemic has led to changes in healthcare-seeking behavior among the population which when combined with the decrease in economic capabilities, potentially could aggravate patients' conditions. Apart from socio-economic factors, demographic and clinical characteristics also has significant role in the mortality of COVID-19 patients. Therefore, it is necessary to investigate the differences in clinical factors, management, and outcomes of pleural effusion patients before and during the COVID-19 pandemic (World Health Organization [WHO], 2019).

COVID-19 infection leads to increased comorbidities in pediatric patients. It has a high morbidity and mortality rate in 2020. In March 2020, the global prevalence of COVID-19 was 275,469 cases. In December 2020, Indonesia had around 612,000 cases. This COVID-19 pandemic may increase the risk of mortality in pleural effusion patients (WHO, 2019). Study by Chong et al in 2021 find an incidence of pleural effusion in COVID-19 as much as 7.3%. Several studies in Indonesia indicate an increase in COVID-19 incidence in children, but the specific data on pleural effusion is not found (Dewi et al., 2021).

During the COVID-19 pandemic, there are suspected changes in the outcomes of pleural effusion in pediatric patients. However, study that comparing the conditions of pleural effusion before and during the COVID-19 pandemic has not been conducted. Additionally, differences in characteristics, management, and mortality of pediatric patients with pleural effusion are still limited. Therefore, further research is needed on the differences in basic characteristics, management, and mortality of pediatric patients with pleural effusion before and during the COVID-19 pandemic.

Based on the background outlined above, this research aims to determine the differences in demographic characteristics, clinical characteristics, etiological characteristics, management, and mortality of pediatric patients with pleural effusion before and during the COVID-19 pandemic. The benefits of this research are both theoretical and practical; theoretically, it contributes to the limited literature on pediatric pleural effusion in the Indonesian context by providing comparative data on characteristics, management, and outcomes, enriching the understanding of how the pandemic influenced clinical presentation including duration of complaints and LDH levels; practically, it provides an evidence-based reference for clinicians in improving diagnosis and management, serves as a basis for hospitals and policymakers in formulating effective protocols and resource allocation strategies to reduce mortality, and offers a replicable methodology for other healthcare facilities to evaluate the impact of public health emergencies on pediatric diseases.

METHOD

Study Sample

The population included children aged 1 month to 18 years old with pleural effusion from February 2018 to March 2022 at RSUP. Dr. M. Djamil Padang, part of the population that met the inclusion and exclusion criteria taken as study sample.

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Study Design

his study uses a quantitative approach with a cross-sectional design through a survey. This study was cross-sectional research with retrospective approach to see the differences in basic characteristics, management, and mortality of pediatric patients with pleural effusion before and during the COVID-19 pandemic. After receiving Ethical Clearance, the study subject who met the inclusion criteria were recruited, and subject who did not undergo pleural fluid analysis and pleural fluid microbiology examination were excluded. Data was obtained from medical records, laboratory and microbiology department and further categorized based on the patient's time of hospitalization, which divided as before and during COVID-19 pandemic.

Statistical Methods

Data was process using Statistical Product and Service Solutions (SPSS) and then subjected to Chi-square statistical analysis regarding the differences in characteristics, management, and mortality of pediatric patients with pleural effusion between before and during the COVID-19 pandemic. Results were considered significant if $p<0.05$.

RESULT AND DISCUSSION

In this study, a total of 55 patients before COVID-19 pandemic were sampled, and 47 patients during the COVID-19 pandemic. The samples were evenly distributed, with 30 patients selected for before COVID-19 pandemic and 30 patients during the COVID-19 pandemic.

Basic Characteristics of Pediatric Patients with Pleural Effusion Before and During the COVID-19 Pandemic

Demographic Characteristics

Table 1. Demographic Characteristics of Pediatric Patients with Pleural Effusion Before and During the Covid-19 Pandemic

Characteristic	Before Covid 19 Pandemic (n=30)		After Covid 19 Pandemic (n=30)	
	f	(%)	f	(%)
Gender				
Male	16	53,30%	17	56,70%
Female	14	46,70%	13	43,30%
Age				
1-12 months	9	30,00%	4	13,30%
2-5 years	1	3,30%	7	23,30%
6-12 years	7	23,30%	6	20,00%
13-18 years	13	43,30%	13	43,30%
Father's Education				
Low	12	40,00%	8	26,70%
High	18	60,00%	22	73,30%
Mother's Education				
Low	11	36,70%	5	16,10%
High	19	63,30%	25	83,90%
Origin				
West Sumatra	23	76,70%	26	86,70%
Outside West Sumatra	7	23,30%	4	13,30%
Nutritional Status				
Malnutrition	16	53,30%	14	46,70%
Well-nutrition	14	46,70%	16	53,30%

Source: Medical record data, RSUP Dr. M. Djamil Padang, processed by the authors (2026)

Based on Table.1, the number of males and females' gender is similar on before and during the COVID-19 pandemic. The most common age group is 13-18 years in both categories. The difference found in the age group 2-5 years old, with the prevalence is increase to 23.3% during the pandemic compared to before the pandemic 3.3%.

In terms of parents' education, majority parents in both groups have a high education level. Generally, children with pleural effusion come from West Sumatra Province (in both groups). Comparing nutritional status before and during the COVID-19 pandemic, malnutrition was found before the pandemic in 53.3% whereas during the pandemic, 53.3% subject had a well nutrition.

Clinical Characteristics

Table 2. Clinical Characteristics of Pediatric Patients with Pleural Effusion Before and During the Covid-19 Pandemic

Characteristic	Before Covid 19 Pandemic (n=30)		Before Covid 19 Pandemic (n=30)		p-value
	f	(%)	f	(%)	
· **Chief complaint**					
Shortness of breath	18	60,00%	23	76,70%	0,061
Fever	7	23,30%	7	23,30%	
Cough	5	16,70%	0	0%	
· **Duration of complaint before hospital admission**					
<2 weeks	22	73,30%	23	76,70%	0,017
2-4 weeks	1	3,30%	6	20,00%	
>4 weeks	7	23,30%	1	3,30%	
· **Pleural fluid analysis**					
Cell counts	5.409 ± 12.964		8.465 ± 17.861		0,138
Glucose	47 ± 41		57 ± 44		0,37
LDH	632 ± 1,069		5.277 ± 10,664		0,021
Albumin	1,4±1,2		1,3±0,8		0,528
PMN					
>50%	17	56,70%	12	40,00%	0,196
≤50%	13	43,30%	18	60,00%	
· **Rivalta Test**					
Positive	28	93,30%	30	100,00%	0,15
Negative	2	6,70%	0	0	
· **Comorbidities**					
Lung Disease	20	66,70%	14	46,70%	0,413
Renal Disease	1	3,30%	3	10,00%	
Cardiac Disease	1	3,30%	2	6,70%	
Malignancy	8	26,70%	11	36,70%	

Source: Medical record data, RSUP Dr. M. Djamil Padang, processed by the authors (2026)

Significant difference was observed in the duration of complaints before hospital admission in before and during the COVID-19 pandemic. Before the COVID-19 pandemic, pediatric patients with pleural effusion tended to have complaints lasting >4 weeks higher than during the pandemic, at 23.3% vs. 3.3% (Table.2). There was also a significant difference in the analysis of pleural effusion fluid, specifically in the LDH (lactate dehydrogenase) levels. During the COVID-19 pandemic, patients with pleural effusion had higher LDH levels compared to before the pandemic ($p<0.05$), at 5,277 ± 10,664 vs. 632 ± 1,069. Interestingly, no pediatric patients with pleural effusion presented with cough as the main complaint during the COVID-19 pandemic (0% vs. 16.7%), although this difference was not statistically significant ($p=0.061$).

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Etiological Characteristics

Table 3. Etiological Characteristics of Pediatric Patients with Pleural Effusion Before and During the Covid-19 Pandemic

Etiologies	Before Covid 19 Pandemic (n=30)		After Covid 19 Pandemic (n=30)	
	f	(%)	f	(%)
No Growth	22	73,30%	20	66,70%
Staphylococcus Aureus	3	10,00%	5	16,70%
Acinetobacter Haemoliticus	1	3,30%	1	3,30%
Pseudomonas Aeruginosa	2	6,70%	1	3,30%
Enterobacteriaceaae	1	3,30%	0	0
Eschericia Coli	0	0	1	3,30%
Klebsiella	1	3,30%	1	3,30%
Others	0	0	1	3,30%

Source: Microbiology laboratory data, RSUP Dr. M. Djamil Padang, processed by the authors (2026)

Based on Table.3 regarding etiological characteristics before and during the COVID-19 pandemic, among all the patients that underwent blood culture, the majority resulted in no microorganism's growth both before and during the COVID-19 pandemic (73.3% and 66.7%, respectively). Some that can be found including; Staphylococcus aureus, with results higher during the COVID-19 pandemic compared to before the pandemic at 16.7% vs. 10%, although statistically these results were not significant (p=0.788).

Differences in Management of Pediatric Patients with Pleural Effusion Before and During the COVID-19 Pandemic

Table 4. Differences in Management of Pediatric Patients with Pleural Effusion Before and During the Covid-19 Pandemic

Treatment Characteristic		Before Covid 19 Pandemic (n=30)		After Covid 19 Pandemic (n=30)		p-value
		f	(%)	f	(%)	
CPAP						
Yes		6	20%	5	16,70%	0,739
No		24	80%	25	83,30%	
Ventilator						
Yes		10	33,30%	11	36,70%	0,787
No		20	66,70%	19	63,30%	
Antibiotic Duration						
<2 weeks		22	73,30%	19	63,30%	0,428
2-4 weeks		4	13,30%	8	26,70%	
>4 weeks		4	13,30%	3	10,00%	
Antibiotic Types						
First Line Antibiotic						
Ampicillin	Yes	19	63,30%	14	46,70%	0,194
	No	11	36,70%	16	53,30%	
Gentamicin	Yes	15	50,00%	10	33,30%	0,19
	No	15	50,00%	20	66,70%	

Streptomycin	Yes	1	3,30%	1	3,30%	0,855
	No	29	96,70%	29	96,70%	
Metronidazole	Yes	6	20,00%	1	3,30%	0,099
	No	24	80,00%	29	96,70%	
Azithromycin	Yes	1	3,30%	0	0,00%	0,313
	No	29	96,70%	30	100,00%	
Ceftriaxone	Yes	10	33,30%	15	50,00%	0,19
	No	20	66,70%	15	50,00%	
Cefotaxime	Yes	4	13,30%	2	6,70%	0,389
	No	26	86,70%	28	93,30%	
Third Line Antibiotic						
Meropenem	Yes	3	10,00%	6	20,00%	0,278
	No	27	90,00%	24	80,00%	
Cefepim	Yes	0	0,00%	1	3,30%	0,313
	No	30	100,00%	29	96,70%	
Cefoperazone	Yes	0	0,00%	1	3,30%	0,313
	No	30	100,00%	29	96,70%	
Amikacin	Yes	1	3,30%	1	3,30%	1
	No	29	96,70%	29	96,70%	
Vankomicillin	Yes	1	3,30%	0	0,00%	0,313
	No	29	96,70%	30	100,00%	
Ceftazidime	Yes	2	6,70%	0	0,00%	0,15
	No	28	93,30%	30	100,00%	
Fosfomycin	Yes	1	3,30%	0	0,00%	0,313
	No	29	96,70%	30	100,00%	
Length of treatment in intensive care (PICU or HCU)						
<1 week		20	66,70%	24	80,00%	0,601
1-2 weeks		5	16,70%	3	10,00%	
>2-4 weeks		2	6,70%	2	6,70%	
>4 weeks		3	10,00%	1	3,30%	

Source: Medical record data, RSUP Dr. M. Djamil Padang, processed by the authors (2026)

The use of respiratory support devices such as CPAP and ventilators in both groups before and during COVID-19 were nearly the same, with utilization of CPAP is at 20% vs. 16.7% and ventilator at 33.3% vs. 36.7% (Table.4). Regarding the use of antibiotics in pediatric patients with pleural effusion, several types of antibiotics were most commonly used before and during the COVID-19 pandemic, such as first-line antibiotics like Ampicillin (63.3% vs. 46.7%) and Gentamicin (50.0% vs. 33.3%). There were also less frequently used antibiotics before and during the COVID-19 pandemic, such as third-line antibiotics including Meropenem, Cefepime, Cefoperazone, Ceftazidime, Amikacin, Vancomycin, and Fosfomycin. Differences in Mortality of Pediatric Patients with Pleural Effusion Before and During the COVID-19 Pandemic.

Table 5. Differences in Mortality of Pediatric Patients with Pleural Effusion Before and During the Covid-19 Pandemic

Outcome	**Before Covid 19 Pandemic (n=30)**		**After Covid 19 Pandemic (n=30)**		***p-value***
	f	**(%)**	**f**	**(%)**	
Mortality					
Survive	20	66,70%	19	63,30%	0,787
Decease	10	33,30%	11	36,70%	

Source: Medical record data, RSUP Dr. M. Djamil Padang, processed by the authors (2026)

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Based on Table.5 regarding mortality before and during COVID-19, the mortality rate in pediatric patients with pleural effusion was quite high, exceeding 30%. The prevalence was higher during COVID-19 (36.7%) compared to before COVID-19 (33.3%), but statistically, it was not significant ($p>0.05$).

Basic Characteristics of Pediatric Patients with Pleural Effusion Before and During the COVID-19 Pandemic

In this study, the demographic characteristics of pleural effusion patients before and during the Covid-19 pandemic showed a predominance of male patients compared to females. Conversely, another study found that more adolescent females seeking healthcare services during the Covid-19 pandemic, likely due to higher levels of anxiety and depression compared to males (Moin et al., 2023).

This study found that the majority of patients were aged 12-18 years old, with noticeable difference is in the 2-5 years old group, which founds higher during the Covid-19 pandemic. Another study explained that adolescents group tend to play with their peers, leading to a higher rate of disease spread and transmission. In contrast, younger children acquire infections from adults, sometimes without clear clinical signs, leading to neglect (Swanepoel & Za, 2023). Consistent with previous research, older children are at a higher risk of lung infections, especially when comorbid factors are present (Murillo-Zamora et al., 2022).

The education level of parents before and during the Covid-19 pandemic was generally high, influencing their knowledge and behavior regarding their children's health, making them more cautious about hospital visits (Sato et al., 2020).

Geographical location also influenced hospital visits due to the distance to hospitals. This study indicated a decrease in patient visits during the Covid-19 pandemic, likely due to government regulations requiring patients and their families from outside the West Sumatra region to undergo antigen swab testing (Mercer et al., 2019).

Nutritional status did not show significant differences between malnourished and well-nourished children before or during the Covid-19 pandemic in this study. However, some journals suggest a correlation between nutritional status and infectious diseases, which malnutrition could worsen a child's condition. Many Covid-19 patients were found to deficit in certain nutrients such as vitamin D, highlighting the importance of nutrition in Covid-19 infections due to hyperinflammatory reactions (Karakaya Molla et al., 2021).

In the clinical characteristics of pleural effusion patients before and during the Covid-19 pandemic, the most common complaint that led patients to be brought to the hospital was shortness of breath, while cough was not reported during the Covid-19 pandemic. This finding aligns with previous research that found symptoms of pleural effusion including chest pain, shortness of breath, and coughing. Chest pain related to pleural effusion caused by inflammation of the pleura in the parietal layer due to friction related to the movement between two pleural surfaces. Chest pain can be localized or diffuse. The Covid-19 pandemic led to delayed hospital visits by parents for their children, resulting in more severe conditions on admission (Mercer et al., 2019).

The results of this study showed significant findings, that is pediatric patients with pleural effusion tended to have complaints lasting >4 weeks ($p<0.05$) before the Covid-19 pandemic. Minimal pleural effusion rarely causes clinical manifestations or is asymptomatic, leading many parents to be unaware until their children have difficulty breathing, indicating massive pleural effusion that interferes with respiration. Some studies suggest that this condition is not influenced by the pre-pandemic or pandemic periods themselves (Mercer et al., 2019; Yilmaz et al., 2011).

Analysis of pleural effusion fluid revealed a cell count of 5,409+12,964 cells before the Covid-19 pandemic and 8,465+17,861 cells during the Covid-19 pandemic. The difference in cell count in pleural fluid analysis is related to the excessive inflammatory response during the Covid-19 pandemic, although this should be accompanied by data on the increase in the pleural fluid LDH-to-serum ratio. The increase in pleural fluid cell count can be caused by various other etiologies or severe infections (Cappelli et al., 2023; Chong et al., 2021). Polymorphonuclear (PMN) cells in pleural effusion fluid showed a higher count of >50% before and <50% during the Covid-19 pandemic. PMN indicates an acute infection process. However, this should also be assessed alongside other factors such as LDH, albumin, and even Rivalta test (Cappelli et al., 2023; Chong et al., 2021; Roberts et al., 2008). Glucose levels in pleural effusion fluid did not differ significantly before or during the pandemic. Glucose in pleural effusion fluid could use as an alternative test and has proven to correlate strongly with infected pleural effusion, serving as a factor for future definitive therapy (Kheir et al., 2016).

This study showed an increase in LDH levels in pleural effusion patients during the Covid-19 pandemic, with levels of 5,277+10,664 compared to 632+1,069 before the pandemic ($p<0.05$). LDH is a cellular enzyme found in various locations, and its levels increase when there is nonspecific tissue damage. LDH serves as a marker of inflammation or cell damage, making it a sensitive but nonspecific pathological marker. LDH levels exceeding three times the upper limit of normal (usually >1,000 U/L) often indicate pleural infection (Mercer et al., 2019). Previous findings indicated that the characteristics of pleural fluid in pediatric patients with Covid-19 are exudative, lymphocytic, or neutrophil-dominant with increased LDH levels (Chong et al., 2021). Another study showed increased levels of C-reactive protein, procalcitonin, LDH, and adenosine deaminase, as well as decreased glucose levels (Golden et al., 2021).

Pleural effusion can be divided into two categories: transudate due to an imbalance between hydrostatic and oncotic pressures, and exudate due to pleural inflammation or lymphatic obstruction. The Light criteria measure cholesterol, bilirubin, and albumin levels in pleural effusion fluid, showing very high sensitivity (98%), lower specificity (77% and 83%), and an overall accuracy of nearly 95%. The difference between serum albumin and pleural fluid albumin levels must be measured. Almost all patients with serum albumin levels >1.2 g/dL have higher pleural fluid albumin levels in transudative effusions. This type of effusion is known as transudative effusion (Karkhanis & Joshi, 2012; Prais et al., 2008).

This study indicates that the majority of pleural effusion etiologies did not involve recognizable causative microorganisms, with blood culture showing no growth before and during the Covid-19 pandemic. Injecting pleural fluid into culture media directly soon after sampling can increase the identification or growth of pathogenic bacteria in pleural infections (Putra et al., 2022). Therefore, sampling method, the amount of fluid, duration of sample delivery, and the medium characteristic influence microbial growth (Menzies et al., 2011). A study at Dr. Zainoel Abidin Hospital in 2019 involving 118 patients showed that only 33 patients had bacterial growth. The absence of bacterial growth can happen due to patients already receiving antibiotic therapy, the incubation conditions that require a specific conditions, or the infections caused by microorganisms other than bacteria. However, some microorganisms, such as Staphylococcus aureus is found. Previous studies showed that Staphylococcus aureus was the most common cause of pleural infection, while Streptococcus pneumonia was the least common (Golden et al., 2021). Methicillin-resistant Staphylococcus aureus is particularly associated with high mortality rates (Ojha et al., 2022).

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Differences in Management of Pediatric Patients with Pleural Effusion Before and During the COVID-19 Pandemic

The use of respiratory support devices in this study showed that more patients did not use CPAP both before and during the Covid-19 pandemic, as well as ventilator. Patients with pleural effusion experiencing respiratory distress should be given positive pressure to reduce the pressure from pleural effusion fluid on the lungs, improve lung oxygenation, and gradually train breathing and mobilization, which can reduce thoracic drainage duration (Oliveira et al., 2010; dos Santos et al., 2020).

This study indicated that commonly used antibiotics were first-line antibiotics such as ampicillin and gentamicin. Ampicillin is the most common drug used in hospitalized children and infants, which is the antibiotic of choice for respiratory tract infections (Ericson et al., 2020). Gentamicin is an aminoglycoside often used in infants and children for bacterial infection treatment, effective against various Gram-negative bacteria and Staphylococcus aureus (Hollander et al., 2023).

Based on the management for pleural effusion in children, antibiotics are given for 14 days. Pleural tapping is performed to examine microbial culture in order to provide appropriate antibiotic treatment with certain duration to prevent the arise of resistant pathogens. Intravenous antibiotic treatment continues until clear clinical improvement was found, followed by oral antibiotics for 1-4 weeks after discharge from the hospital (Sauteur et al., 2019).

Differences in Mortality of Pediatric Patients with Pleural Effusion Before and During the COVID-19 Pandemic

In this study, it was found that the mortality rate of pediatric patients with pleural effusion remained similarly high before and during the Covid-19 pandemic (33.3% and 36.7%, respectively). Previous meta-analysis research showed that the prevalence of pleural effusion during the Covid-19 pandemic increased by 9.55%. The presence of pleural effusion is a sign of worsening prognosis. This highlighting the recommendation that pediatric patients with pleural effusion should be managed early on (Singh Rathore et al., 2022). However, mortality can increase up to 40% in cases with gram-negative infections, Staphylococcus aureus, or mixed aerobic bacterial infections. This is in contrast to pleural effusions that are exudative, which are not associated with a higher mortality rate compared to transudative effusions (Das & Khosla, 2013; Putra et al., 2022).

CONCLUSION

Based on the results and discussions above, it can be concluded that there is a significant difference in the duration of symptoms before admission to the hospital. Before the pandemic, duration of symptoms >4 weeks were found, whereas during the Covid-19 pandemic, no symptoms lasting >4 weeks were found. There is a significant difference in the level of LDH in pleural effusion fluid, with an increased LDH level during the Covid-19 pandemic compared to before the pandemic. There were no significant differences in management, including the use of respiratory support (CPAP or ventilator), antibiotic administration, as well as mortality among pediatric patients with pleural effusion before and during the Covid-19 pandemic.

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