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Risk factors of mortality on diarrhea children under five years old hospitalized in Dr. Soetomo General Academic Hospital Surabaya 2023

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Abstract

Through the years, diarrhea has been one of the significant causes of mortality among children under the age of five years old all over the world. Throughout 2021, approximately 444,000 children under five years old died due to diarrhea, making up about 9% of all children under five years old's mortality. Diarrhea is a gastrointestinal disease characterized by increased bowel movements causing three or more stool episodes along with a loose or watery consistency within 24 hours. There are several risk factors that contribute to the mortality of children with diarrhea under the age of five years old. This study aimed to determine which risk factors are significant enough to cause the mortality of children under the age of five years old suffering from diarrhea. This retrospective analytic study was conducted by observing the medical records of children under five years old hospitalized in Dr. Soetomo General Academic Hospital Surabaya due to diarrhea during 2023. Data were analyzed by using chi-square bivariate analysis with the SPSS version 30 application. The results show that septic shock and septicaemia are significant factors contributing to the mortality of children under five years old suffering from diarrhea. Furthermore, dehydration, and s proven to not significantly affect mortality in diarrheal patients under the age of five years old, yet this factor is proven to be significant to contribute to the patient's length of stay in the hospital ward at RSUD Dr. Soetomo Surabaya. On the other hand, a patient's gender and age are proven to be not significant to cause mortality in children under five years old suffering from diarrhea.

Keywords: Diarrhea; Children; Septic Shock; Septicaemia; Dehydration

1. Introduction

Through the years, diarrhea is still one of the leading cause of children mortality worldwide, especially in children under the age of five years old. Data reported by the Indonesian Ministry of Health on 2018 reported that there were around four millions reported diarrhea cases of children under the age of five years old, or around 17% prevalence rate[1]

Diarrhea is a gastrointestinal disease characterized by increased bowel movements resulting to abnormal stool episode, three or more stool episode per 24 hours [2]. Diarrhea might be caused by several etiologies, based on its root causes it classifies into infectious diarrhea and non-infectious diarrhea. Non-infectious diarrhea is usually caused by malabsorption, anatomical defect, malignancies, allergies, food poisoning, and others. While infectious diarrhea is caused by infectious pathogen[3]

Notable risk factors contributing to diarrhea among children below 5 years old include nutritional condition such as wasting and malnutrition[4]. Study in children with low nutritional status shows an altered immune system, as a

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consequence, there is an elevated vulnerability to invasive infections, including those affecting the urinary and gastrointestinal systems, as well as an increased risk of septicemia[5].

A study done by Hartman et al., 2023 presents that infants below the age of 6 months has the highest risk of mortality, twice as high if compared to children between 2 and 5 years of age, this is happens because infants is more vulnerable to infections. Additionally, the study shows that female is attributed with a higher likelihood of mortality due to diarrhea as it is attributed to the lack of proper nutrition in female children.

Diarrhea causes excessive water loss, making dehydration to be the most common complication for diarrhea patients. Approximately 20% of peadiatric deaths is associated with dehydration related to gastroenteritis[6]. Some publications also mentioned septic shock is featured in the death of patients with infectious diseases, including diarrhea [7]. The primary complication of diarrhea is dehydration leading to severe sepsis, and septic shock[7, 8]

This study aimed to determine risk factors of mortality among diarrhea patients under the age of five years old hospitalized in RSUD Dr. Soetomo 2023. Proper understanding of the risk factors that may correlates with the mortality diarrhea is important, in order to give a comprehensive approach for patient with diarrhea. Thus, unwanted complication can be prevented and increases patient's quality of life and decrease mortality rate of patients with diarrhea.

2. Material and methods

This study is a retrospective analytic study done by observing medical records of patients under five years old who were hospitalized for diarrhea in RSUD Dr. Soetomo, Surabaya in 2023. The purpose of this study is to determine whether certain variables, such as age, gender, nutritional status, dehydration, septicaemia, and septic shock are a significant contributors to the mortality of children under the age of five years old hospitalized of diarrhea in RSUD Dr. Soetomo, Surabaya. This study was conducted for 5 months, from June to October 2024.

Populations sample for this study are 175 patients selected with consecutive sampling in accordance with the inclusion and exclusion criteria required for this research. Inclusion criteria for this study are patients from age 0 months – 60 months, hospitalized in RSUD Dr. Soetomo Surabaya with diagnosis of diarrhea as the medical indication for inpatient. While the exclusion criteria for this research are patients with congenital abnormalities, genetic disorders, immunocompromised patients, and patients with metabolic disorders, such as diabetes.

Data for patients' age and gender were gathered from the demographic data written on patients' medical record. Data for dehydration, septicaemia, and septic shock on patients' are gathered from the diagnosis recorded medical record and laboratory examinations result attached in patients' medical record during their hospitalizations of diarrhea.

The collected data are analyzed with Statistical Product and Service Solution (SPSS) 30 version application. Bivariate analysis was done to determine whether there is a significant relationships between the variables (age, gender, dehydration, septicaemia, and septic shock) and mortality with chi-square hypothesis test.

3. Results and discussion

Throughout 2023, there were 253 children under 5 years old patients hospitalized of diarrhea in RSUD Dr. Soetomo that met inclusion and exclusion criteria for this research. However, 78 patients are excluded as it met the exclusion criteria for this research as explained itn the prvious chapter. Thus, leaving 175 patients with eligible data that met the inclusion criteria for this research. Ethical clearance for data collection process of this research has been granted by the Ethical Committee of RSUD Dr. Soetomo, Surabaya.

Table 1 The Distribution and Characteristic of Research's Subjects

Characteristic	**Total**	**%**
Gender		
Male	99	56
Female	76	44
Age		
0-12 months old (infants)	86	49
13- 60 months old (children)	89	51
Nutritional Status		
Undernutrition	78	44.5
Normal	97	55.5
Dehydration		
Without dehydration	48	28
Mild/moderate/severe dehydration	127	72
Septicaemia		
Without septicaemia	169	96.5
Septicaemia	6	3.5
Septic Shock		
Without septic shock	2	1.14
Septic shock	173	98.86
Patients' Discharged Status		
Recovered	172	98.2
Death	3	1.71

Each variable of the data presented in **Table 1** were then analyzed by using bivariate chi-square test acknowledge whether there is a significant correlation between the tested variable and the mortality of diarrhea patients under five years old.

Table 2 Bivariate Chi-Square Test Analysis of Patients' Gender and Mortality

Gender	**Discharged Status**			**OR (CI 95%)**	**P value**
	Recovered	**Death**	**Total**		
Male	97 (55.4%)	2 (1.14%)	99(56.5%)	2.18 (0.18-23.53)	0.127
Female	75 (42.8%)	1 (0.57%)	76 (43.4%)		
Total	172 (98.2%)	3 (1.71%)	175 (100%)		

Table 2 presents the result of bivariate chi-square analysis of patients' gender and mortality. Data shown in above indicate that there is no significant correlations between patients' gender and mortality on diarrhea patients under five years old. This can be proven by the p value score of 0.127 and wide confidence interval range that includes 1of odd ratio, ranging from that indicates no significant correlation.

Table 3 Bivariate Chi-Square Test Analysis of Patients'Age and Mortality

Age	Discharged Status			OR (CI 95%)	P value
	Recovered	Death	Total		
Infants (0-12 months)	84 (48%)	2 (1.14%)	86(49.15%)	2.095 (0.186 – 23.539)	0.375
Children (13-60 months)	88 (50.2%)	1 (0.57%)	89 (50.85%)		
Total	172(98.29%)	3 (1.71%)	175 (100%)		

Table 3 provides the bivariate analysis result between patients' age and mortality of diarrhea patients under the age of five years old. However, the result shows no significant correlation between patients' age and mortality on children under five years old with diarrhea.

Table 4 Bivariate Chi-Square Test Analysis of Degree of Dehydration and Mortality; Degree of Dehydration and Hospital Length of Stay

Degree of Dehydration	Discharged Status		OR (CI 95%)	P value	Length of Stay		P value
	Recovered	Death			≥5 days	<5 days	
Mild/ Moderate/ Severe Dehydration	124 (70.8%)	3 (1.14%)	1.024 (0.997 – 1.052)	1.154	80 (45.7%)	47 (26.8%)	0.022
Without Dehydration	48 (27.5%)	0 (0.57%)			21 (12%)	27 (15.4%)	
Total	172 (98.3%)	3(1.71%)			101 (57.7%)	74 (42.2%)	

Table 4 presents the result of bivariate analysis between degree of dehydration and mortality of diarrhea patients under the age of five years old and the bivariate analysis result between degree of dehydration and patients' duration of hospitalization. The chi-square bivariate analysis of the relationship between degree of dehydration and mortality shows there is no significant correlation between the two, this is supported by the p value score of 1.154. However, there is a significant correlation between degree of dehydration and patients' hospitalization length of stay. Patient with dehydration tends to have longer hospitalization duration compared patients without dehydration. This is supported by the p value score of 0.022.

Table 5 Bivariate Chi-Square Test Analysis of Septicaemia and Mortality

Septicaemia	Discharged Status			OR (CI 95%)	P value
	Recovered	Death	Total		
Septicaemia	4 (2.3%)	2 (1.2%)	6 (3.5%)	84.00 (6.257 – 1127.785)	<0.001
Without Septicaemia	168 (96%)	1 (0.57%)	169 (96.5%)		
Total	172 (98.3%)	3 (1.71%)	175 (100%)		

Table 5 provides the result of bivariate analysis between septicemia and mortality of diarrhea patients under five years old. This table prove that septicaemia is a statistically significant factor that correlates with mortality of diarrhea patients under the age of five years old. Patients with septicaemia have higher risk of mortality compared to patients without sapticaemia this is supported with high odds ratio score, 84.00 and p value score of <0.001.

Table 6 presents the result of bivariate analysis chi-square test between septic shock and mortality of diarrhea patients under the age of five years old. Based on the results, it can be concluded that patients with septic shock has a significantly higher odds of mortality rate compared to patients without septic shock, this is supported with the low odds ratio of 0.06 that suggests the negative impact of septic shock on recovery and the p value score of <0.001.

Table 6 Bivariate Chi-Square Test Analysis of Septic Shock and Mortality

Septic shock	Discharged Status			OR (CI 95%)	P value
	Recovered	Death	Total		
Septic shock	0	2 (1.2%)	2 (1.2%)	0.06 (0.001-0.041)	<0.001
Without Septic shock	173 (98.8%)	0	173 (98.8%)		
Total	173 (98.8%)	2 (1.2%)	175 (100%)		

Following an in-depth analysis examination of possible risk factors influencing mortality of diarrhea on patients' under the age of five years old hospitalized in RSUD Dr. Soetomo Surabaya, several remarkable observations can be highlighted. There were several factors that are statistically significant to attributes on mortality on patients with diarrhea under the age of five years old hospitalized in RSUD Dr. Soetomo. These factors are septicaemia and septic shock. It is well known that diarrhea is one of the most common cause of septicaemia among children under the age of five years old. Septicaemia in children is life-threatening organ dysfunction (Phoenix Sepsis Score ≥2) due to infection, with septic shock involving cardiovascular dysfunction (score ≥1), thus patient with septicaemia has higher odds of developing septic shock that may results to death [9]This is in line with the research conducted by Sarmin et al., 2019 done in Bangladesh with subjects of 1000 diarrhea patients within the age of 0-59 months where out of 1000 patients treated for diarrhea, 191 suffered from septicaemia, and 70 dies out of septic shock [7]

Nevertheless, some factors such as degree of dehydration is proven to be statistically significant factors that contributes notably to the duration of hospital stay for patients with diarrhea, yet those factors is not significantly affect mortality of diarrhea on the dependent variable of this research. Dehydration is the most common complication of diarrhea, this cascade happens as a result of fluid loss during the frequent stool episode[8]. A study done in Wangaya General Hospital Denpasar supported this research as it proves that there were correlations between degree of dehydration and patient's length of stay. Patients who experienced dehydration has longer hospital stay compared to patients who are not dehydrated[10]findings is in line with this research, where the p value score of the correlation between dehydration and patient's length of stay.

In this research, age and gender are not statistically correlated with the mortality of diarrhea patients under five years old in this study. Study done in Dhaka by Jarman, et al., 2018 regarding the correlation between gender and the severity of diarrhea manifestation between boys and girls are quite similar [11] Hartman et al., 2023, found that female children have a higher likelihood of mortality due to diarrhea, which is attributed to the lack of proper nutrition. Moreover, Hartman et al., 2013, reported that infants under six months of age are at the highest risk of mortality compared to older children [4]. Infants are more susceptible to infections due to the immaturity of their immune systems[12]However, in this research, no significant correlation between age, gender, and mortality was observed. This finding may be attributed to research limitations, such as a small sample size or a low event rate (mortality).

4. Conclusion

Septic shock and septicemia were found to be significantly associated with mortality among children under five years old hospitalized with diarrhea at RSUD Dr. Soetomo in 2023. In contrast, no statistically significant association was observed between gender, age, or degree of dehydration and mortality in this study population. It is important to note, however, that previous studies have reported a significant relationship between the degree of dehydration and mortality. The lack of such an association in this study may be influenced by improvements in public health interventions, such as enhanced sanitation, increased breastfeeding rates, early recognition of diarrhea, and greater household use of oral rehydration solutions and zinc supplementation. Furthermore, while the degree of dehydration was not associated with mortality, it was found to significantly correlate with the length of hospital stay.

Compliance with ethical standards

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Disclosure of Conflict of interest

There is no conflict of interest to be disclosed.

Statement of ethical approval

This research received ethical approval from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia.

References

[1] At Thobari J, Sutarman, Mulyadi AWE, et al. Direct and indirect costs of acute diarrhea in children under five years of age in Indonesia: Health facilities and community survey. Lancet Reg Health West Pac; 19. Epub ahead of print 2022. DOI: 10.1016/j.lanwpc.2021.100333.

[2] Schiller LR, Pardi DS, Sellin JH. Chronic Diarrhea: Diagnosis and Management. Clinical Gastroenterology and Hepatology; 15. Epub ahead of print 2017. DOI: 10.1016/j.cgh.2016.07.028.

[3] Imanadhia A, Ranuh IRG, Nuswantoro D. Etiology Based on Clinical Manifestation of Acute Diarrhea Incidence of Children Hospitalized in Dr. Soetomo General Hospital Surabaya Period 2011-2013. Biomolecular and Health Science Journal; 2. Epub ahead of print 2019. DOI: 10.20473/bhsj.v2i1.12744.

[4] Hartman RM, Cohen AL, Antoni S, et al. Risk Factors for Mortality Among Children Younger Than Age 5 Years With Severe Diarrhea in Low- and Middle-income Countries: Findings From the World Health Organization-coordinated Global Rotavirus and Pediatric Diarrhea Surveillance Networks. Clinical Infectious Diseases; 76. Epub ahead of print 2023. DOI: 10.1093/cid/ciac561.

[5] Dipasquale V, Cucinotta U, Romano C. Acute malnutrition in children: Pathophysiology, clinical effects and treatment. Nutrients; 12. Epub ahead of print 2020. DOI: 10.3390/nu12082413.

[6] Prisco A, Capalbo D, Guarino S, et al. How to interpret symptoms, signs and investigations of dehydration in children with gastroenteritis. Arch Dis Child Educ Pract Ed; 106. Epub ahead of print 2021. DOI: 10.1136/archdischild-2019-317831.

[7] Sarmin M, Afroze F, Sharifuzzaman, et al. Predictor of Death in Diarrheal Children Under 5 Years of Age Having Severe Sepsis in an Urban Critical Care Ward in Bangladesh. Glob Pediatr Health; 6. Epub ahead of print 2019. DOI: 10.1177/2333794X19862716.

[8] Putri DNA, Ongo MRD, Andriany S. Acute diarrhoea with severe dehydration and complications in a 1-year-old child: a case report in a hospital with low resource setting. Int J Res Med Sci; 11. Epub ahead of print 2023. DOI: 10.18203/2320-6012.ijrms20233725.

[9] Watson RS, Carrol ED, Carter MJ, et al. The burden and contemporary epidemiology of sepsis in children. The Lancet Child and Adolescent Health 2024; 8: 670–681.

[10] Budihardjo SN, Suryawan IWB, Sucipta AAM. The relationship between nutritional status with length of stay in 1-5 years old children with diarrhea at Wangaya General Hospital Denpasar. Indonesia Journal of Biomedical Science 2020; 14: 113–117.

[11] Jarman AF, Long SE, Robertson SE, et al. Sex and gender differences in acute pediatric diarrhea: A secondary analysis of the Dhaka study. J Epidemiol Glob Health; 8. Epub ahead of print 2018. DOI: 10.2991/j.jegh.2018.08.102.

[12] Aulia M, Triratna S, Iriani Y, et al. Pediatric sofa score for detecting sepsis in children. Paediatrica Indonesiana(Paediatrica Indonesiana); 61. Epub ahead of print 2021. DOI: 10.14238/pi61.1.2021.1-7.