Risk factors of death among children hospitalized with social insurance (BPJS): a cross sectional study using hospital claim data

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Abstrak

Latar belakang: *Angka kematian di rumah sakit merupakan salah satu indikator yang digunakan untuk mengukur kinerja dan kualitas pelayanan. Tujuan penelitian ini untuk menganalisis faktor risiko kematian pada anak yang dirawat dengan BPJS kesehatan di satu rumah sakit di Jakarta.*

Metode: *Penelitian potong lintang pada satu rumah sakit pemerintah di Jakarta. Sampel menggunakan semua data klaim pasien BPJS selama periode Januari - Desember 2017. Semua pasien BPJS berusia di bawah 18 tahun yang dirawat dimasukkan dalam analisis. Regresi logistik digunakan untuk menganalisis faktor risiko kematian anak.*

Hasil: *Dari total 18,941 jumlah pasien BPJS yang dirawat, sebanyak 3689 data anak yang dianalisis. Proporsi angka kematian anak selama satu tahun sebesar 7,3%. Kasus dengan tingkat keparahan derajat II memiliki risiko kematian 11,51 kali lipat [rasio odds suaian (ORa) = 11,51; IK*=7,45-17,78*; P = 0,000] dibandingkan tingkat keparahan penyakit derajat I, sedangkan kasus dengan tingkat keparahan derajat III beresiko terhadap kematian 33,97 kali lipat (ORa = 33,97;IK*=19,93-57,91*; P = 0,000). Selain itu, anak yang memiliki indikasi dirawat di ICU meningkatkan risiko kematian* 14,21 *kali lipat (ORa =* 14,21*; IK*=9,15-22,08*; P= 0,000) dibandingkan yang tidak ada indikasi ICU. Kondisi tertentu yang timbul pada periode perinatal meningkatkan risiko kematian anak* 7,65 *kali lipat (ORa =* 7,65 *; IK*=1,81-32,35*;P = 0,006) dibandingkan penyakit pada sistem muskuloskeletal dan jaringan ikat.*

Kesimpulan: *Tingkat keparahan penyakit, indikasi ICU dan kondisi tertentu yang timbul pada periode perinatal adalah faktor risiko kematian anak yang paling sering di rumah sakit.* ***(Health Science Journal of Indonesia 2020;11(2):115-20)***

Kata kunci: *faktor risiko, kematian, anak, BPJS*

Abstract

Background: Hospital death rate is one of the indicators used to measure hospital performance and quality of care, especially the overall hospital death rate. This study aims to analyze the risk factors of death among children hospitalized with social insurance (BPJS) in one hospital in Jakarta.

Method: This was a cross-sectional study conducted in one government hospital in Jakarta. The sample was all individual claim data of BPJS patients who were hospitalized during the period of January to December 2017. All BPJS patients aged below 18 years admitted into the pediatric wards were included in the analysis. The logistic regression was used to analyze the risks of children death

Results: A total of 18.941 BPJS inpatients in the hospital was identified, out of the 3689 met the inclusion criteria. The proportion of death in children during one year was 7.3%. Illness severity level II had 11.51-fold [adjusted odds ratio (ORa)=*11.51;CI*=7.45-17.78*; P=0.000]*] meanwhile severity level III had *33.97*-fold higher risk of children death (ORa=*33.97*; *CI*=19.93-57.91*;P=0.000*) compared to children with severity level I. Children who had ICU indicator increase risk of children death at 14.21 -fold (ORa=14.21*;IK*=9.15-22.08*;P= 0.000)* compared to those who did not have. Furthermore the risk of children death in certain conditions originating in the perinatal period increases by 7.65–fold (ORa=7.65*;IK*=1.81-32.35*;P=0.006)* compared to diseases of the musculoskeletal system and connective tissue.

Conclusion: Illness severity level, ICU indicator and diseases in certain conditions originating in the perinatal period are the most common risk factors for children death in the hospital. ***(Health Science Journal of Indonesia 2020;11(2):115-20)***

Keywords: risk factors, death, children, BPJS

A hospital inpatient ward is a place where necessary care is provided to patients whose health conditions require hospital admission for a certain time.[1] Inpatient care has become the core of services at the hospital and has a significant contribution to hospital revenue.[2] Therefore, the demands for excellent service and quality need to be managed properly. The information of inpatient productivity can be measured through several indicators.[3] Hospital death rate is one of the indicators used to measure hospital performance and quality of care, especially the overall hospital death rate.[4,5] It shows the proportion of patients who die during or immediately after the patients were admitted to the hospital.[6]

Shihab et al reported that National Health Insurance (Jaminan Kesehatan Nasional/JKN) program increases the utilization of hospitalization both in the government and private hospitals.[7] It opens wider access to nationwide inpatient utilization.[7] The roll-out of JKN introduced in 2014 aims to extend financial coverage for health care to at least 95 % of the population by 2019. Nearly half of children (47%) have health insurance programs in 2015. Out of those with insurance, as many as 23% were covered by *Badan Penyelenggara Jaminan Sosial* (*BPJS* / Social Security Agency).[8]

There is an increasing number of hospitalization in children, particularly in the urban areas and large community hospitals.[9] Improving the quality of care for seriously ill children is essential for reducing children death. Many factors were associated with the death rate in children such as mother's age at birth, mother's educational level, and mother's household socioeconomic, several diseases (malaria, diarrhea diseases, respiratory infections, and malnutrition), breastfeeding duration, total health care visits, low birth weight.[10, 11] Beside that living in poor households, living in rural areas, birth rank, birth interval, previous death of a sibling, having other children under 5 years old, contraceptive, type of births, complications, history of previous mortality, antenatal care and place of delivery were also considered to contribute with childhood mortality.[12, 13, 14]

Risk factors data for hospital death is widely assessed from socioeconomic factors, and the use of claim data for hospital evaluation is still limited in Indonesia. Although hospital-based mortality reviews may not reflect the multiple causes of all deaths in a large population, it can examine the causes that contribute to deaths occurring in hospital and identify inadequate care. The present study aimed to analyze the risk factors of death among children hospitalized with BPJS insurance in one hospital in Jakarta.

METHODS

This study was a cross-sectional study conducted in one government hospital in Jakarta. The sample was all individual claim data of BPJS patients who were hospitalized during the period of January to December 2017. The inclusion criteria was BPJS patients aged below 18 years admitted into the pediatric wards. The data with incomplete records was excluded from the analysis.

The outcome of the study was children death (death in children occurs both before and after 48 hours of admission over one year period). The independent variables of interest in this study were age, gender, hospital accommodation level, illness severity level, length of hospital stay (LOS), ICU indicator, ICU length of stay, and diseases category.

Age group was divided into two groups: less than 5 / under 5/ Balita and 5-17 (years). Gender was categorized into two groups: male and female. Hospital accommodation level was divided into three categories first class, second class and third class. Illness severity was grouped into severity level I(without complications or comorbidity), II(mild complications and comorbidity), III(major complications and comorbidity).[15] Illness severity level was automatically generated by the Indonesian Case Based Groups (INA-CBGs) software grouper application after entering the principal and secondary diagnosis. Length of hospital stay was categorized into 7 days or less and more than 7 days (the time from patient admission to the hospital until discharge), ICU indicator was grouped as yes (If the patient is admitted to the ICU during the treatment episode) and no. ICU length of stay was divided as 3 days or less and more than 3 days. Principal diagnosis was used to classify the diseases according to ICD 10 Category (2010). There were 20 disease groups identified in this study and several disease groups with a number of cases less than 100 cases were assigned to "other" groups. The diseases groups were certain infectious and parasitic diseases; diseases of the respiratory system; diseases of the digestive system, diseases of the musculoskeletal system and connective tissue; diseases of the genitourinary system, certain conditions originating in the perinatal period, symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; injury, poisoning and certain other consequences of external causes; factors influencing health status and contact with health services; others (mental and behavioral disorders; diseases of the nervous system; diseases of the circulatory system; diseases of the skin and subcutaneous tissue; diseases of the ear and

mastoid process; endocrine; nutritional and metabolic diseases; pregnancy, childbirth and the puerperium; diseases of the nervous system; diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism; neoplasms)

The data was tabulated according to various factors included in this study and analyses were performed using the STATA version 9. The logistic regression model was used for multivariate analysis. Variable with a significance level (*p*-value) < 0.25 on bivariate analysis was kept in a multivariate model. Stepwise regression and likelihood ratio test was performed to select the final model.

This study was approved by The Ethics Committee, Faculty of Public Health, University of Indonesia with a letter number: 564/UN2.F10/PPM.00.02/2017. The confidentiality of the patient's information was ensured in such a way that the data will be used for the study purpose only.

RESULTS

A total of 18.941 BPJS inpatients in the hospital was identified, out of the 3689 met the inclusion criteria. The proportion of death in children during one year was 7.3% (271/3689).

As shown in Table 1, compared to the respective reference groups, children under five years, LOS more than 7 days, children who had ICU indicator and ICU LOS more than 3 days were more likely to increase the risk of children death. The higher the severity level of diseases also seems to have a higher risk of death in children. Those who had the risk of death and did not have were similarly distributed in terms of gender and accommodation level (P > 0.05).

In respect with diseases group based on ICD, children who had diseases of respiratory system, infectious and parasitic diseases, certain conditions originating in the perinatal period, congenital malformations, deformations and chromosomal abnormalities, as well as factors influencing health status and contact with health services were more likely to increase the risk of children death compared to those with the musculoskeletal system and connective tissue disease groups.

Table 2 the final model demonstrates severity level II had 11,51-fold while severity level III had 33.97-fold higher risk of children death compared to children with severity level I. In addition, children who had ICU indicator increase risk of children death at 14.21-fold compared to those who did not have. Furthermore, the risk of children death in certain conditions originating in the perinatal period; symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified increase by 7.65–fold and 6.05-fold respectively compared to diseases of the musculoskeletal system and connective tissue.

DISCUSSION

This study showed that the greater the severity of illness, the greater the risk of death in children. The severity of illness is a condition of disorder in the organ system that can be assessed using demographic, clinical, physiological, and laboratory results.[16] The severely ill children have a clinical condition with severe organ systems dysfunction. If the condition was not treated properly and immediately, the risk of sequelae and death would have increased significantly.[17] In the case mix system, the severity is affected by the presence of a complication or comorbidity (secondary diagnosis).[18] The severity indicates how sick and what burden of illness has suffered by the patient. Patients often have additional diseases or medical condition which accompanies the main disease. Therefore, the existence of comorbidity is more likely to have worse initial well-being. Additional diseases will worsen the clinical course of the disease. Martins reported that the patients with one comorbidity have a higher mortality rate compared to patients without comorbidity.[19] However Chang LS et al in Chang-Gung Memorial Hospital-Kaohsiung, Taiwan, found the death in pediatric patients without comorbidities in several cases.[20] It was more common in younger children with the central nervous system and cardiovascular infections, consciousness change, and high liver enzyme levels at admission.[20]

This study found when children were admitted to the ICU during the treatment episode, they had a greater risk of death 14.21-fold compared to those who did not. Most of the patients in ICU have at least one organ failure at the time of death. The death may take place suddenly or unexpectedly due to hemodynamic causes or occur later with many organ failures.[21] Children with ICU indicator was in critical condition or unstable or potentially unstable which poses a threat to the life of the patient. Intensive care provides integral management, optimum care with specialized personnel and equipment. Therefore, ICU allows the treatment for critically ill patients who need close vigilance and had potentially recoverable conditions.[22] The patients should be admitted to the ICU before achieving irreversible health conditions.

This study demonstrated that certain conditions originating in the perinatal period had 7.65-fold for children death compared to the musculoskeletal system and connective tissue. Zhu et al in China reported that the majority of death occurred in infants (42%) over a 10 years period with pneumonia as the largest proportion for the immediate cause of death.[9] Lahmini et al in Marrakech mentioned that among pediatric patients, neonatal mortality was predominant followed by postnatal mortality (1 month to 1 year old).[23] Meanwhile the leading cause of pediatric mortality (at all ages) was neonatal pathologies.[23] The differences with this study may be due to the different data sources as well as different research designs and analyses.

This study has limitations, which did not represent the general population. Several determinants were not available in the claim data such as signs and symptoms, laboratory results, medications prescribed by physicians, and referred from other facilities.

Table 1. Several characteristics and risk of children death

Variable	Children death				Crude OR	95 Confidence interval	*P*
	No (n=3418)		Yes (n=271)				
	n		n				
Age groups (Years)							
Above five	1319	94.5	77	5.5	1.00	Reference	
Under five (Balita)	2099	91.5	194	8.5	1.58	1.21-2.08	0.001
Gender							
Male	2002	93.3	144	6.7	1.00	Reference	
Female	1416	91.8	127	8.2	1.25	0.97-1.59	0.081
Accomodation level							
First class	399	93.0	30	7.0	1.00	Reference	
Second class	858	93.6	59	6.4	0.91	0.58-1.44	0.701
Third class	2161	92.2	182	7.8	1.12	0.75-1.67	0.579
Severity level							
I	2635	98.5	40	1.5	1.00	Reference	
II	650	82.9	134	17.1	13.58	9.44-19.53	0.000
III	133	57.8	97	42.2	48.04	31.97-72.21	0.000
Lenth of hospital stay							
7 or less	2336	94.5	135	5.5	1.00	Reference	
More than 7	1082	88.8	136	11.2	2.17	1.69-2.79	0.000
ICU Indicator							
No	2911	97.4	77	2.6	1.00	Reference	
Yes	507	72.3	194	27.7	11.24	8.47-14.91	0.000
Length of stay in ICU							
3 or less	3225	95.2	162	4.8	1.00	Reference	
more than 3	193	63.9	109	36.1	14.47	10.93-19.15	0.000
Grouping ICD							
Diseases of the musculoskeletal system and connective tissue	132	98.5	2	1.5	1.00	Reference	
Diseases of the respiratory system	181	84.2	34	15.8	12.40	2.93-52.52	0.001
Diseases of the digestive system	242	98.4	4	1.6	1.09	0.20- 6.04	0.921
Diseases of the genitourinary system	118	97.5	3	2.5	1.68	0.28-10.22	0.574
Certain conditions originating in the perinatal period	942	91.2	91	8.8	6.38	1.55-26.19	0.010
Congenital malformations, deformations and chromosomal abnormalities	361	93.8	24	6.2	4.39	1.02-18.82	0.047
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	159	97.5	4	2.5	1.66	0.30- 9.21	0.562
Injury, poisoning and certain other consequences of external causes	241	96.4	9	3.6	2.47	0.53-11.58	0.253
Certain infectious and parasitic diseases	237	93.3	17	6.7	8.77	2.11-36.44	0.003
Factors influencing health status and contact with health services	414	88.3	55	11.7	4.73	1.11-20.11	0.036
Others	391	93.3	28	6.7	4.73	1.08-20.81	0.040

Table 2. The final model for risk of children death

Variable	Adjusted OR	95 Confidence interval	*P*
Severity level			
I	1.00	Reference	
II	11.51	7.45-17.78	0.000
III	33.97	19.93-57.91	0.000
ICU Indicator			
No	1.00	Reference	
Yes	14.21	9.15-22.08	0.000
Grouping ICD			
Diseases of the musculoskeletal system and connective tissue	1.00	Reference	
Certain conditions originating in the perinatal period	7.65	1.81-32.35	0.006
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	6.05	1.09-33.60	0.039

*Adjusted each other between variables listed on this table, age, gender, length of hospital stay, length of stay in ICU.

In conclusion, illness severity level, ICU indicator and diseases in certain conditions originating in the perinatal period are the most common risk factors for children death in the hospital. The clinical pathways could be implemented to standardize patient management and improve hospital cost efficiency, however this must be followed by conducting an audit of clinical pathway compliance as quality control. Expansion of neonatal or pediatric intensive care unit (NICU/PICU) and improvement of the skill of its staff to reduce mortality caused by certain conditions originating in the perinatal period.

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REFERENCES

1. Lorenzetti J, Gelbcke FL, Vandresen L. Management technology for hospital inpatient care units. Texto Context - Enferm. 2016;25(2):1–11.
2. Dewi NF, Santoso RK. The performance analysis of inpatient installation at Tria Dipa hospital with Balanced Scorecard, 2013–2015. KnE Soc Sci. 2018;3(11):1566–83.
3. Rosita R, Tanastasya AR. Penetapan mutu rumah sakit berdasarkan indikator rawat inap. J Kesehat Kusuma Husada. 2019;10(2):166–78. Indonesian.
4. Lilford R, Pronovost P. Using hospital mortality rates to judge hospital performance: a bad idea that just won't go away. BMJ. 2010;340(7753):955–7.
5. Bisbis B, El Gamri A. Using in-hospital mortality as an indicator of quality care and hospital performance. Int J Med Surg. 2016;3(1):6–9.
6. Goodacre S, Campbell M, Carter A. What do hospital mortality rates tell us about quality of care? Emerg Med J. 2015;32(3):244–7.
7. Shihab AN, Nurdin A, Kadir A, Paturusi I, Student P, Hasanudin U, et al. National health insurance effects on inpatient utilization in Indonesia. Int J Heal Sci Res. 2017;7(4):96–106.
8. Indonesia Ministry of National Development Planning and the United Nations Children's Fund. SDG baseline report on children in Indonesia [Internet]. Jakarta. 2017. [Cited 2020 April 30]; Available from: https://reliefweb.int/sites/reliefweb.int/files/resources/SDG_Baseline_Report_on_Children_in_Indonesia%281%29-1.pdf
9. Zhu Y, Zhu X, Deng M, Wei H, Zhang M. Causes of death in hospitalized children younger than 12 years of age in a Chinese hospital: a 10 year study. BMC Pediatrics; 2018;18(1):1–7.
10. Babayara MNK, Addo B. Risk factors for child mortality in the Kassena-Nankana district of Northern Ghana : a cross-sectional study using population-based data. Scientifica. 2018;2018(1):1–7.
11. Chaman R, Alami A, Emamian MH, Naieni KH, Mirmohammadkhani M. Important risk factors of mortality among children aged 1-59 months in rural areas of Shahroud , Iran : a community-based nested case-control study. Int J Prev Med. 2012;3(12):875–9.
12. Ezeh OK, Agho KE, Dibley MJ, Hall JJ, Page AN. Risk factors for postneonatal , infant , child and under-5 mortality in Nigeria : a pooled cross-sectional analysis. BMJ Open. 2015;5(3):1–9.
13. Abir T, Agho KE, Page AN, Milton AH, Dibley MJ. Risk factors for under-5 mortality : evidence from Bangladesh demographic and health survey, 2004 – 2011. BMJ Open. 2015;5(8):1–9.
14. Warrohmah ANI, Berliana SM, Nursalam N, Efendi F, Haryanto J, Has EMM, et al. Analysis of the

survival of children under five in Indonesia and associated factors. In: 3rd International Conference on Tropical and Coastal Region Eco Development : Earth and Environmental Science. 2018. p. 1–6.
15. Kementerian Kesehatan RI. Peraturan menteri kesehatan republik indonesia nomor 76 tahun 2016 tentang pedoman Indonesian Case Base Groups dalam pelaksanaan JKN [Internet]. Jakarta. 2016. [Cited 2020 April 30]; Available from: https://peraturan.bpk.go.id/Home/Details/114633/permenkes-no-76-tahun-2016
16. Vincent J, Carvalho FB De. Severity of illness. Semin Respir Crit Care Med. 2010;31(1):31–8.
17. Onofre N, Batista W, Pereira J, Carlota M, Coelho DR, Trugilho SM, et al. Admission criteria in a pediatric intensive therapy unit : presentation of an evaluation instrument. Int J Res Stud Med Heal Sci. 2018;3(10):44–51.
18. Puspitorini S, Kusumadewi S, Rosita L. Prediction of disease case severity level to determine INA CBGs rate. In: The International Conference on Information Technology and Digital Applications : Materials Science and Engineering. 2017. p. 1–6.
19. Martins M. Use of comorbidity measures to predict the risk of death in Brazilian inpatients. Rev Saude Publica. 2010;44(3):448–56.
20. Chang LS, Kuo HC, Wu CC, Yu HR, Wang L, Chang HW, et al. Risk factors for mortality of pediatric patients without underlying diseases. Pediatr Neonatol. 2011;52(1):34–7.
21. Barjon G, Constantin J, Dhonneur G, Goguey C, et al. Causes and characteristics of death in intensive care units. Anesthesiology. 2017;126(5):882–9.
22. López-herce J, Álvarez AC. Guidelines of admission, discharge and organization of the pediatric intensive care. Med Intensiva. 2018;42(4):203–4.
23. Lahmini W, Bourrous M. Mortality at the pediatric emergency unit of the Mohammed VI teaching hospital of Marrakech. BMC Emerg Med. 2020;20(1):1–13.