

Performance of Neonatal Unit, Arifin Achmad Hospital, Pekanbaru

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Abstract

Background Arifin Achmad Hospital is the largest hospital in Riau Province, Indonesia, which serves as referral hospital and offers tertiary care for sick neonates.

Objective To review the performance of the Neonatal Unit of Arifin Achmad Hospital as a mean to further improve the overall care with specific interest to improve neonatal outcomes.

Methods We collected the clinical data of all patients admitted to the Neonatal Unit from 2008 to 2010. Diagnoses were classified according to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (Revised ICD 10). We evaluated the overall performance of the unit, including number of beds, number of patients, and bed occupancy rates (BOR). The spectrum of diagnoses was also described. Associations between clinical characteristics and patient outcomes were analyzed using univariate Chi square test.

Results The number of available beds increased from 10 beds in 2008 to 24 beds in 2010, thereby decreasing the BOR from 112% in 2008 to 82% in 2010, despite the yearly increase in number of patients (702 in 2008, 772 in 2009, and 821 in 2010). Most Neonatal Unit patients were male, aged 0-3 days at the time of admission, had birth weights of 2500-4000 grams, born in RSUD Arifin Achmad and were born vaginally. Respiratory problems, prematurity and infections were the three main reasons for admission. Birth weight, the presence of congenital malformations, referral status, and < 7 day length of stay were associated with mortality.

Conclusions The performance of the unit increased during the 3-year period of study. Most patients admitted had respiratory problems, fetal growth problems, or infections. We found that birth weight, congenital malformations, referral status, and decreased length of stay were prognostic factors for patient outcomes. [Paediatr Indones. 2012;52:356-61].

Keywords: neonate, mortality

According to the Ministry of Health, Republic of Indonesia,¹ infant mortality in the Riau Province was higher than nationally. Riau had a neonatal mortality of 28/1000 live births, which is lower than the national neonatal mortality of 34/1000 live births. However, for infant mortality, Riau had 37/1000 live births as compared to national infant mortality of 34/1000 live births.

Globally, it is estimated that of the 130 million babies born annually, 4 million die in the first 28 days of life. About three-fourths of neonatal deaths occur in the first 7 days of life.^{2,3} In Southeast Asia,⁴ 54% of neonatal deaths are caused by prematurity, infections, and asphyxia. In Indonesia the main causes of neonatal mortality during the first 6 days of life are respiratory problems (35.9%), prematurity (32.4%), sepsis (12%), hypothermia (6.3%), blood disorder / jaundice (5.6%), postmaturity (2.8%) and congenital malformations (1.4%).⁵ One target of Indonesia's 4th Millennium Development Goals (MDG) is to reduce infant mortality by 2015, with a focus on reducing neonatal mortality.

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Arifin Ahmad Hospital in Pekanbaru is the highest referral hospital in the Riau Province and its neonatal unit accept referrals for level 3 neonatal care since 2010. The neonatal unit cares for infants with diseases caused by maternal, infant, or delivery problems. Since neonatal and infant mortality rates in Riau are high, profiles of patients admitted to the

unit may give important information for developing strategies for effective and efficient care. This report describes the characteristics of patients admitted to the unit during the 3-year period of 2008-2010. We highlight the risk factors for neonatal mortality during the 3 year period.

Methods

We reviewed data from the medical records of patients admitted to the Neonatal and Feto-maternal Units, Arifin Achmad Hospital from January 2008 to December 2010 in this retrospective, cross-sectional study. In addition to evaluating the overall performance of the unit (including number of beds, number of patients, and bed occupancy rate), we recorded patients' data including sex,

Table 1. Neonatal unit performance by year

Variables	2008	2009	2010
No. of beds	10	24	24
No. of patients	702	772	821
No. of days	4.090	5.749	7.147
BOR, %	111.7	65.6	81.6
BTO per year	70	32	35
TOI, days	-1	4	2
ALOS, days	6	7	9

BOR bed occupancy rate; BTO = bed turnover rate; TOI = turn over interval; ALOS = average length of stay.

Table 2. Characteristics of infants admitted to the Neonatal Unit during 2008-2010

Variables	2008		2009		2010	
	n	%	n	%	n	%
Gender						
Male	408	58.1	449	58.2	515	62.7
Female	294	41.9	323	41.8	306	37.3
Age at admission, days						
0-3	591	84.2	676	87.6	707	86.1
4-7	36	5	32	4.1	48	5.8
8-28	68	9.7	60	7.8	61	7.4
>28	7	1	4	0.5	5	0.7
Birth weight, grams						
<1000	24	3.4	17	2.2	21	2.6
1000-2500	273	38.9	306	39.6	298	36.3
2501-4000	327	46.6	360	46.6	410	49.9
4001-4500	62	8.8	57	7.4	69	8.4
>4500	16	2.3	32	4.1	23	2.8
Method of delivery						
Vaginal	500	71.2	517	67	546	66.5
Caesarean section	202	28.8	255	33	275	33.5
Patient source						
Arifin Ahmad Hospital	464	66.1	484	62.7	447	54.4
Referred from elsewhere	238	33.9	288	37.3	374	45.6
Length of hospital stay						
0-24 hrs	242	34.5	193	25	158	19.2
25-48 hrs	97	13.8	74	9.6	84	10.2
2-7 days	207	29.5	256	33.2	292	35.6
8-14 days	91	13	133	17.2	182	22.2
15-30 days	52	7.4	100	13	80	9.7
> 30 days	13	1.9	16	2.1	25	3
Discharge condition						
Survived	513	73.1	574	74.4	623	75.9
Died < 24 hrs	102	14.5	48	6.2	47	5.7
Died 25-48 hrs	24	3.4	33	4.3	26	3.2
Died > 48 hrs	63	9	117	15.2	125	15.2
Payment method						
Out-of-pocket	409	58.3	401	51.9	276	33.6
Government subsidy	293	41.7	371	48.1	545	66.4

age, birth weight, delivery method, referral history, diagnosis, length of hospital stay, and payment method. Diagnoses were classified according to the Revised ICD 10.⁶ Associations between clinical characteristics and patient outcomes were analyzed by univariate Chi square test. A P value of <0.05 was considered significant and odds ratios with 95% confidence intervals were calculated.

Results

There were 2,317 infants admitted to the Neonatal Unit from 2008-2010. However, only 2,295 patients had complete data, consisting of 702 patients in 2008, 772 in 2009, and 821 in 2010. Patients' characteristics are shown in **Table 1**.

Table 2 depicts the clinical characteristics of patients admitted to the neonatal unit. During the three-year period, the male patients outnumbered females, admitted at age 0-3 days, of normal birth weight, delivered vaginally, from Arifin Achmad Hospital, and had a less than 7-day length of hospital stay.

Table 3 shows the patient diagnoses according to the Revised ICD 10. Most problems were related to the respiratory or cardiovascular systems (P20-28), fetal growth (P05-08), and infections (P35-39).

We analyzed the associations of clinical characteristics with patient outcomes (survived vs. died), as shown in **Table 4**. Survival was not associated to gender and age group on admission, but was significantly associated with birth weight, patient source, mode of delivery, diagnostic category, and length of hospital stay.

Table 3. Patient diagnosis distribution according to the 2007 Revised-ICD 10

Diagnosis	2008		2009		2010	
	n	%	n	%	n	%
Perinatal diseases						
Pregnancy complications	1	0.1	0	0	0	0
Fetal growth problems	211	30.1	192	24.9	170	20.7
Birth trauma	3	0.4	4	0.5	6	0.7
Diseases related to respiratory or cardiovascular system	143	20.4	195	25.2	224	27.3
Infections	94	13.4	164	21.3	169	20.6
Bleeding	29	4.1	35	4.5	65	7.9
Endocrine or metabolic diseases	34	4.8	24	3.1	39	4.8
Digestive problems	1	0.1	2	0.3	1	0.1
Conditions related with temperature	74	10.5	51	6.6	19	2.3
Congenital malformations						
Central nervous system	12	1.7	13	1.7	13	1.6
Circulatory system	9	1.3	3	0.4	3	0.4
Cleft lip and palatoschisis	8	1.1	15	1.9	17	2.1
Digestive system	30	4.3	31	4	53	6.5
Genital organ	0	0	0	0	1	0.1
Urinary system	0	0	0	0	1	0.1
Musculoskeletal system	19	2.7	17	2.2	13	1.6
Multiple congenital malformations	10	1.4	11	1.4	9	1.1
Chromosomal abnormality	4	0.6	5	0.6	5	0.6
Neonatal problems						
Neonatal tetanus	8	1.1	2	0.3	1	0.1
Infectious diseases	2	0.3	5	0.6	2	0.2
Tumors	1	0.1	0	0	0	0
Respiratory system	5	0.7	2	0.3	4	0.5
Digestive system	2	0.3	1	0.1	0	0
Skin disorders	2	0.3	0	0	6	0.7

Table 4. Univariate analysis of clinical characteristics and patient outcomes

Variables	Died		Survived		P value	OR (95%CI)
	n	%	n	%		
Gender						
Females	235	40.2	688	40.2	0.979	0.99 (0.82 to 1.03)
Males	350	59.8	1022	59.8		
Age groups on admission						
< 7 days	534	91.3	1556	91.0	0.833	1.04 (0.74 to 1.44)
> 7 days	51	8.7	154	9.0		
Birth weight						
Abnormal	393	67.2	805	47.1	0.000	2.30 (1.89 to 2.80)
Normal (2500-4000 g)	192	32.8	905	52.9		
Patient source						
Arifin Ahmad Hospital	278	47.5	1117	65.3	0.000	0.48 (0.39 to 0.58)
Referred from elsewhere	307	52.5	593	34.7		
Mode of delivery						
Cesarean section	109	18.6	623	36.4	0.000	0.40 (0.32 to 0.50)
Vaginal	476	81.4	1087	63.6		
Diagnosis						
Congenital malformations	98	16.8	204	11.9	0.003	1.49 (1.14 to 1.93)
Perinatal problems	487	83.2	1506	88.1		
Length of hospital stay						
> 7 days	136	23.2	556	32.5	0.000	0.63 (0.51 to 0.78)
< 7 days	449	76.8	1154	67.5		

Discussion

Since 1998 the Neonatal Unit of Arifin Ahmad Hospital has attempted to improve its physical and human resource capacities to enhance care. Inadequate facilities led to the 1.4 times increase in number of beds between 2008 and 2009. In 2008, the BOR exceeded 100%, but decreased to 65-81% in the two subsequent years, in accordance with increased capacity and improved standards of care.^{7,8} Because of its role as the main referral hospital in Pekanbaru, continual improvements should be made. International standards require that one bed to be used 40-50 times in a one-year period.⁷ In our neonatal unit in 2009-2010, the BTO rate was 32-25 per year.

Most infants were admitted at the age of 0-3 days and were delivered vaginally. The majority of cases were born at the Department of Obstetrics and Gynecology, Arifin Ahmad Hospital. For referred cases, early referral to the neonatal unit may indicate the willingness of outside medical and paramedical personnel to have their patients acquire better care in our tertiary unit to limit sequelae associated with asphyxia, meconium aspiration, or birth trauma.

Arifin Ahmad Hospital has been fully accredited 3 times, most recently in 2011. Birth delivery is managed by physicians and paramedics with training

in high risk obstetrics, and comprehensive emergency obstetrical and neonatal care. Such training should continue in the coming years with the aim of reducing maternal and infant morbidity and mortality.⁹⁻¹²

As predicted, most infants admitted to the unit were of normal weight (2501-4000 grams), followed by those with very low birth weight, then infants with birth weight of more than 4000 grams. It is known that low birth weight (both in premature or term infants) is associated with higher mortality compared to normal weight. In Southeast Asian countries, 54% of neonatal mortalities were associated with prematurity, infections, and asphyxia.¹³ In the 3-year period of this study, there was no change in premature deliveries, indicating that the hospital must improve facilities and human resource competence to reduce neonatal morbidity and mortality.

In 2008, diagnoses were predominantly perinatal problems, especially with severe growth conditions, such as low birth weight or very low birth weight, including intrauterine growth retardation. Some infants with low birth weight were twins. Perinatal problems were followed by respiratory/cardiovascular conditions, and then infections. In 2009 and 2010 the most common problem was respiratory/cardiovascular, including mostly asphyxia, transient tachypnea of the newborn (TTN) and respiratory distress, with

percentages similar to that of fetal growth problems, and followed by infections. Thus, respiratory problems, birth weight, and infections were conditions often found in admissions to the neonatal unit.

Congenital malformations (Q00-Q99) ranked second in frequency to perinatal diseases, with occurrence of 13.1% in 2008, 12.2% in 2009, and 14.1% in 2010. Digestive tract congenital malformations were the most prevalent in this category. We could not provide data to analyze associations between risk factors in the development of congenital malformations to factors such as use of drugs or infection during pregnancy.

The majority of infants were discharged alive, and this number increased over the 3-year period. This reduction in mortality may reflect improved quality of care which has been a concern of the hospital management. The Provincial Health Office and Ministry of Health also had an important role, by improving the capability of primary health facilities in the network system to better manage patients with milder problems, so that they referred only infants requiring level-3 neonatal care to our unit.

Univariate analysis of associations between clinical characteristics and patient outcomes revealed that the following factors were associated with poor outcomes: abnormal birth weight, patients referred from elsewhere, vaginal delivery mode, congenital malformations, and < 7 days length of hospital stay. The risk for poor outcome (death) was classified as mild to moderate (OR 1.5 to 3). We did not perform multivariate analysis since this was not an etiologic study to find the cause of death; rather it was a prognostic study to encourage caregivers to pay attention to infants with abnormal birth weight and congenital malformations, those referred from other health facilities, and those delivered vaginally with respiratory or other problems.

We observed a marked improvement in payment methods over the 3-year period. In 2008 and 2009 most families paid out-of-pocket (58.3% and 51.9%, respectively), while in 2010 only one-third of patients paid out-of-pocket. This data indicates an improvement in national and provincial government health coverage.

In summary, we found that during 2008-2010 our neonatal unit admissions were predominantly male, aged 0-3 days at the time of admission, had

birth weight of 2500-4000 grams, and born vaginally. Respiratory problems, prematurity and infections were three of the main causes of admission to the unit. Factors significantly associated with poor outcomes were abnormal birth weight, vaginal delivery, referral from outside the hospital, and the presence of congenital malformations.

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