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Original Research

Short-term Outcomes of Preterm Infants in a Medical Center at Banyumas Regency, Indonesia: A Preliminary Study

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Abstract

Introduction: Short-term outcomes of preterm infants refers to any preterm infants' conditions after birth including medical diagnosis or morbidity, length of stay at the hospital, and readmission to hospital after discharge. A high number of preterm births were identified as the major case in the year of 2015 in a medical center at Banyumas Regency, Indonesia. However, limited evidence showed the preterm infants' short-term outcomes in this medical center. This study was intended to investigate the short-term outcomes of preterm infants in a medical center, Banyumas Regency, Indonesia.

Methods: The study used a retrospective design with a case-control study involving a convenience sampling of data set from 50 preterm and 50 term infants who were born from January to December 2015 in a medical center, Banyumas Regency, Indonesia. Any preterm infants' outcomes from the hospital medical record were collected. Chi-Square, T-test, and Mann-Whitney U were used for statistical analysis.

Results: The study showed that preterm infants experienced low birth weight (LBW), respiratory distress syndrome (RDS), jaundice, and longer length of stay at the hospital compared to term infants (p<0.01; p=0.027; p<0.01; p<0.01, respectively). Surprisingly, the study found there was no significant difference in readmission to the hospital between two groups.

Conclusion: Healthcare professionals can use the data as considerations for improving preterm infants' optimal care.

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INTRODUCTION

Preterm infants are infants who born at <37 weeks' of gestational age. It can be categorized into four categories: 1) extremely preterm infants (infants who born at <28 weeks' of gestational age); 2) very preterm infants (infants who born at 28- <32 weeks); 3) moderate preterm infants (infants who born at 32- <34 weeks); and 4) late preterm infants (infants who born at age 34-36 weeks) [1, 2]. Since preterm infants are born too soon, they may have a higher risk to develop some morbidity compared to the term infants. A study by Celik, et al. found 30% of late preterm infants were treated in the Neonatal Intensive Care Unit (NICU) [3]. In detailed, preterm infants experienced respiratory distress, low birth weight, hyperbilirubinemia, feeding difficulty, polycythemia, and hypoglycemia [3-5]. Moreover, preterm infants have 0.34 times higher risk to experience resuscitation [6].

The higher risk for preterm infants to develop morbidities may result in higher preterm infant mortality compared to term infants. Studies showed that late preterm infants have higher mortality rates than term infants [3, 7, 8]. Small gestation infants (preterm infants with small weights for pregnancy) have a higher risk of morbidity especially for those aged between 28-38 weeks of gestational age [9]. The length of stay for preterm infants was also longer compared to term infants [3]. A study found that the preterm infants' hospital length of stay reached 17.6 days [10]. Another study found metabolic acidosis to be a major cause of preterm infants' hospitalization [11].

The preterm infants' hospital readmission is higher compared to the term infants [3]. The major cause for readmission to the hospital was hyperbilirubinemia and the infants' age of the hospital's readmission was 6.2 ± 3.6 days [12]. Preterm infants aged <25 weeks' of gestational age have the highest risk for readmission and the longest hospital stay [13]. Next, the various conditions experienced by preterm infants after birth are labeled as short-term outcomes of preterm infants. This term includes morbidity (the medical diagnosis), the hospital's length of stay, and readmission to the hospital after discharge. Research conducted by Vachharajani and Dason used the term short-term outcomes to refer to the preterm infants' respiratory problems, length of stay in the hospital, and age to reach full feeding [14].

Globally, it is estimated that 11.1% of infants born alive are born prematurely (14.9 million infants were born before 37 weeks' of gestation). Direct complications of preterm birth account for one million deaths each year, and preterm birth is a risk factor in over 50% of all neonatal deaths. Based on Blencowe, et al., Indonesia was ranked fifth in the world with a high preterm birth rate. Moreover, Indonesia ranks eleventh as a country with more than 15% premature births annually [1]. A medical center with a high number of preterm births is located at Banyumas Regency. Data from the hospital's medical record showed the preterm infants' prevalence reaching 11% in 2015 (444 preterm infants out of 4026 infants born). We found that preterm infants at the medical center were born at 28 weeks to <37 weeks.

At the medical center, preterm infants who needed ventilator care were treated in a neonatal care level 3. The high-risk infants such as preterm infants with low birth weight, term infants who suffered multiple morbidities were nursed at level 2 neonatal care. Healthy preterm infants were handled at level 1 neonatal care. This category of neonatal care classification was following the policy statement of the American Academy of Pediatrics [15].

The preterm infants' nursing care at the hospital focused on the preterm infants' respiratory problems, nutrition, hypothermia, hypoglycemia, risk of infection, etc. The effect of the nursing care gave the preterm infants' positive outcomes such as the infants discharged from the hospital with a health condition. However, we found that the case fatality rate for preterm infants was still 17.3% in 2015, with 44 deaths among 444 infants born prematurely at the hospital. This data indicated there was one infant mortality among six preterm infants' delivery.

Since the preterm infants' case fatality rate in the medical center, Banyumas Regency, Indonesia was quite high, the investigation of the preterm infants' short-term outcomes is pivotal. The preterm infants' short-term outcomes refer to the preterm infants' various conditions after delivery, including the infants' morbidity (the medical diagnosis), the hospital's length of stay, and readmission after discharge. However, limited study has been conducted to investigate the preterm infants' short-term outcomes in the medical center, Banyumas Regency, Indonesia.

Therefore the study was intended to examine the preterm infants' short-term outcomes compared to term infants in a medical center at Banyumas Regency, Indonesia. This study is expected to be able to add new knowledge about the preterm infants' various health problems that occur after delivery including the length of stay and readmission to the hospital after discharge. In this study, we argued that there were differences in short-term outcomes between infants born prematurely with those who born at term.

METHODS

Study Design

We used a retrospective design with a case-control study. A retrospective designed is one in the present that is linked to the phenomena that occurred in the past [16]. We used the hospital's medical record data set of preterm infants as case and the term infants' data set as control. For each respondent, we entered the demographic data (infants' age and gender), the maternal pregnancy type (singleton, twin, and triplets), medical diagnosis, length of stay at the hospital, and readmission to the hospital.

Study Population

The population in our study were preterm infants who born < 37 weeks' of gestational age and term infants who born at 37 to <42 weeks of gestational age during the year 2015 (January-December) in a medical center, Banyumas Regency, Indonesia. Using the hospital medical records, we identified 444 preterm infants (11%) and 3582 term infants

(89%) who were born during the year 2015 in this medical center.

Sample and Sampling Technique

The study used a convenience sampling of data set from 50 preterm infants, and 50 term infants who born between January-December 2015 in a medical center, Banyumas Regency, Indonesia. Convenience sampling refers to samples taken by researchers based on convenient accessibility and proximity [17]. In this type of research sampling, participants are consecutively selected in order of appearance according to the convenient accessibility (also known as consecutive sampling). The sampling process comes to an end when the total amount of participants (participant saturation) and/or the time limit (time saturation) are reached [18]. In our study, we collected the data of preterm and term infants based on convenient data accessibility. The inclusion criteria in our study were data set from preterm infants who born <37 weeks' of gestation and term infants who born at 37-<42 weeks' of gestation during the year 2015 from a medical center, Banyumas Regency, Indonesia.

Data Analysis

We used Chi-Square for analyzing the categorical data and T-test or Mann-Whitney U for numeric data [19]. Chi-Square analysis was used to differentiate the medical diagnosis between two groups. Mann-Whitney U was utilized to test the differences of the hospital's length of stay between groups since Shapiro Wilk analysis showed a *p-value*<.05. The Shapiro Wilk's analysis indicated the hospital's length of stay not normally distributed. We tested the infants' readmission to the hospital after discharge using the T-test since Shapiro Wilk analysis demonstrated *p-value*>.05 that indicated the normal distribution of the infants' readmission to the hospital.

Ethical Considerations

This study has been approved by the Educational and Research Committee at Margono Soekarjo Hospital number 421/21531/VIII/2016. In this study, we considered clinical research's ethical principles based on the Declaration of Helsinki (World Medical Association, 2001). We used the respondents' code to guarantee respondents' privacy and dignity. Moreover, we stored data on a computer with a password and only the researchers can access the data to assure the confidentiality principle.

RESULTS

Our study focused on the preterm infants' short-term outcomes that are referred to the preterm infants' condition after delivery including the medical diagnosis, the hospital's length of stay, and readmission to the hospital after discharge. The respondents' characteristics can be seen in Table 1, while the short-term outcomes of preterm infants are presented in Table 2.

It can be seen from Table 1, there was a similarity of gender proportion between the two groups. Most of the preterm infants were delivered from singleton pregnancy as well as term infants. However, Chi-Square analysis found that there was a significant difference by the maternal pregnancy type between

groups. Twenty-four percent of preterm infants were delivered from twin or triplets' pregnancy, while all term infants were born from a singleton pregnancy.

Table 2 showed that there was a significant difference by the medical diagnoses type between groups of Low Birth Weight (LBW), Respiratory Distress Syndrome (RDS), and Jaundice (p=<.01; p=.027; p=<.01 respectively). It can be seen that 74% of preterm infants experienced LBW, 12 % have RDS, and 40% suffered jaundice. Mann-Whitney U analysis showed there was a significant difference in the hospital's length of stay for preterm and term infants (p=<.01). Preterm infants showed a longer length of stay at the hospital (1 until 25 days) than term infants (1 until 5 days). Our study also found that there was no significant difference in readmission to hospital after discharge among two groups.

Table 1
Characteristics of respondents

Variables	Preterm Infants		Term Infants		*p value*
	n	%	n	%	
Gender					1
Male	39	78	39	78	
Female	11	22	11	22	
Pregnancy type					<.01*
Singleton	38	76	100	100	
Twin or triplets	12	24	0	0	

* Significant at *p value* <.01

Table 2
Short-term outcomes of preterm infants in a medical center at Banyumas Regency, Indonesia

Variables	Preterm Infants		Term Infants		*p value*
	n	%	n	%	
Low birth weight					
Yes	37	(74%)	0	(0)	<.01*
No	13	(26%)	50	(100%)	
Respiratory distress syndrome					
Yes	6	(12%)	0	(0%)	.027**
No	44	(88%)	50	(100%)	
Severe birth asphyxia					
Yes	3	(6%)	0	(0%)	.242
No	47	(94%)	50	(100%)	
Mild to moderate asphyxia					
Yes	3	(6%)	0	(0%)	.242
No	47	(94%)	50	(100%)	
Vomitus					
Yes	1	(2%)	0	(0%)	1
No	49	(88%)	50	(100%)	
Bacterial sepsis					
Yes	1	(2%)	0	(0%)	1
No	49	(88%)	50	(100%)	
Jaundice					
Yes	20	(40%)	0	(0%)	<.01*
No	30	(60%)	50	(100%)	
Hypothermia					
Yes	2	(4%)	0	(0%)	.495
No	48	(96%)	50	(100%)	
Neonatal conjunctivitis	1	(2%)	0	(0%)	1
Yes	49	(88%)	50	(100%)	
No					
Other neonatal gastro-intestinal hemorrhagic					
Yes	1	(2%)	0	(0%)	1
No	49	(88%)	50	(100%)	
Congenital hydrocephalus					
Yes	1	(2%)	0	(0%)	1
No	49	(88%)	50	(100%)	
Multiple anomaly congenital					
Yes	1	(2%)	0	(0%)	1
No	49	(88%)	50	(100%)	
Length of stay (median)	9	(1-25)	1	(1-5)	<.01*
Readmission					
Yes	2	(4 %)	2	(4 %)	1
No	48	(96%)	48	(96 %)	

*significant at *p value* <.01; **significant at *p value* <.05

DISCUSSION

Our study was designed to investigate the preterm infants' short-term outcomes in a medical center at Banyumas Regency, Indonesia. The preterm infants' short-term outcomes referred to the preterm infants' condition after delivery including the medical diagnosis, length of stay at the hospital, and readmission to the hospital after discharge.

The study found that there was no significant difference in gender between groups. The prior study using a retrospective method involving infants born in extremely preterm (< 28 weeks' of gestation) found 54.7% of 2549 respondents infants were male preterm infants [20]. The finding supported that preterm births more common for male infants. James argued the sex of zygote is associated with parental hormone concentration around the time of conception. High concentrations of estrogen and testosterone are associated with the subsequent birth of boys. Moreover, it was speculated that there was a U-shaped regression of the human offspring sex ratio (proportion male) on time of formation of the zygote within the fruitful cycle [21].

Our study supported no difference by gender between groups and it contradicted the prior study. The study result differences with the previous research's research may relate to the small number of sample size in our study. A small number of sample sizes may not represent the preterm infants' population in the research site. The hospital's regulation restricted data retrieval for a preliminary study only around 100 data.

Our study showed that there was a difference in maternal pregnancy type between groups. Twenty-four percent of preterm infants were born from twin or triplets' pregnancy. While all term infants were born from a singleton pregnancy. Singleton was identified as one of the precursors for preterm infants' birth [8]. It contradicted the prior study. We argued mothers with multiple pregnancies have higher stress compare to term infants and result in preterm infant birth. Our argumentation was supported by Owen et al., a study that found experience of severe social stress predicted preterm infants' birth in twin pregnancies [22]. Wang, et al., found prenatal stress in twin pregnancies increases with the progression of pregnancy. The overall mean score of prenatal stress was 43.41 ± 19.84 and 51.33 ± 20.43 in early and late pregnancy, respectively. Higher stress in late pregnancy is associated with a higher risk of premature rupture of membranes [23]. The premature rupture of membranes (PROM) was one of the precursors to develop preterm infants' birth [8].

Our study demonstrated that preterm infants tend to develop LBW compared to term infants. In our hospital research site, the infants' weight < 2000 grams have to treat in level 2 or 3 neonatal care. Since our preterm infants were retrieved from level 2 or 3 neonatal care, it common sense that the preterm infants experienced LBW. Inappropriate coordination between swallow-respiratory interfacing is speculated as a cause for feeding difficulties of preterm infants [24] and may relate with LBW. Therefore, providing feeding for preterm infants should respect preterm infants' cues or behavior such as their ability to make

coordination between suck, swallow, and breathing during feeding.

Further, our study found that there was a difference in RDS incidence between preterm and term infants. Preterm infants commonly suffer RDS and it tends to decrease following the maturation of gestational age [3, 25]. Respiratory distress syndrome can occur in premature infants as a result of surfactant deficiency and underdeveloped lung anatomy [4].

Respiratory distress syndrome is a respiratory problem. Preterm infants' respiratory problems will affect on preterm infants' feeding ability. Safe feeding requires proper coordination between suck, swallow, and breathing [26]. Lau speculated feeding difficulties in preterm infants are more likely to result from inappropriate swallow-respiration interfacing than suck-swallow interaction [24]. Therefore, providing feeding for preterm infants using human milk or direct breastfeeding for preterm infants should consider with preterm infants' behavior or cues.

Our study investigated that jaundice more common for preterm infants. We argued that jaundice is the result from the liver function immaturity. The previous study found that late preterm infants have a 2.4 times higher risk to develop hyperbilirubinemia compared to term infants [5]. Jaundice was identified as one of the reasons for late preterm infants to the hospital's admission [3]. Delayed initiation of breastfeeding, insufficient frequency, and ingestion of maternal milk may result in jaundice [27].

Besides that, our study showed that preterm infants had a longer length of stay at the hospital. The prior study supported that length of stay in the hospital for preterm with some morbidities such as RDS, LBW, jaundice, feeding difficulties, hypoglycemia, and others [3, 6, 27].

The study found that there were no differences in readmission to the hospital between two groups. We argued that when the preterm infants discharged, their age is mature. So, their condition may similar to the term infants. In our study, the time and reason for readmission were different between groups. Readmission for preterm infants commonly during 30 days after discharge and the main causes for late preterm infants' rehospitalization were jaundice and feeding problems [28]. Another study in California, America found that the common cause for preterm infants' readmission to hospital is acute respiratory disease [13].

Knowing the short-term outcomes of preterm infants in Banyumas Regency, the healthcare professional can use the data for improving the preterm infants' optimal care. Since we found that preterm infants' suffered LBW, RDS, jaundice, we consider for improving the preterm infants' care through safe and effective feeding through providing breastfeeding or human milk with considering the preterm infants' behavior. Human milk provides benefits for preterm infants [29], including for support preterm infants' growth and development.

CONCLUSION

Preterm infants seem likely to develop LBW, RDS, jaundice, and a longer length of stay at

the hospital compared to term infants. Surprisingly, the hospital's readmission after discharge did not show the difference between preterm and term infants. Longer treatment in the hospital followed preterm infants' age progression resulted in a similar condition between groups. Moreover, there was no difference between groups for risk of readmission to the hospital. Besides that, our study found preterm infants' birth can occur to both male and female genders which indicated a new finding from our study and need more exploration in the future study.

RECOMMENDATION

Healthcare professionals can use the data as considerations for improving preterm infants' optimal care including providing human milk or direct breastfeeding by emphasizing preterm infant's behavior to support preterm infants' growth and development.

CONFLICT OF INTEREST

We declared that we have no conflict of interest in this study.

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