

Factors associated with the occurrence of hyperbilirubinemia in infants

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ABSTRACT

Hyperbilirubinemia is a problem that often occurs in newborns characterized by icterus, yellowish pigmentation of the skin, sclera, and nails. Many factors cause hyperbilirubinemia in infants such as the type of labor, birth weight, gestational age, gender, and asphyxia. This research aimed to discover the factors associated with the occurrence of hyperbilirubinemia in infants. This was a quantitative research with a retrospective cohort design. There were 83 respondents as the research sample taken using a random sampling technique. The research data were analyzed using the chi-square test and multivariate logistic regression. The majority of respondents underwent labor with actions (59 respondents / 71.1%), delivered male babies (51 respondents / 61.4%), delivered babies with normal birth weight (56 respondents / 67.5%), had a full-term pregnancy (54 respondents / 65.1%), and did not experience asphyxia (65 respondents / 78.3%). In addition, most respondents gave birth to babies with hyperbilirubinemia (43 respondents / 51.8%). Chi-square test results indicated a correlation between the type of labor ($p = 0.008$), birth weight ($p = 0.019$), gestational age ($p = 0.000$), and asphyxia ($p = 0.013$) with the incidence of hyperbilirubinemia. While the variable of gender ($p = 0.106$) had no correlation. The most influential factor was gestational age ($p = 0.027$) with an odds ratio of 4.011. In conclusion: The types of labor, birth weight, gestational age, and asphyxia have a correlation with the occurrence of hyperbilirubinemia.

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1. INTRODUCTION

The incidence of hyper-bilirubin in Nepal based on birth weight less than 2000 grams was 33 babies from 963 babies. It was found among the babies weighing 2000-2499 grams in 121 babies from the total 4629, those with 2500-2999 grams in 230 babies from the total 8290, and among the babies with more than 3000 grams in 169 babies from 4523 [1]. Widiawati's research [2] shows that the incidence of neonatal jaundice every year has always increased, such as in the Randen Mattaheer Jambi Hospital. In 2014, there were 89 babies and in 2015 it was found in 102 babies. Based on a preliminary study in the Perinatology Room of the Banyumas Hospital, the incidence of hyperbilirubin in 2018 was 12.8% (486 cases out of 3790 births). This figure is much higher than in 2016 and 2017 which was only 7.02% (222 cases out of 3161 births), and 7.82% (273 cases out of 3488 births) respectively. There is an increase of the incidence from 2016-2018.

The incidence of neonatal jaundice in low birth weight (LBW) babies on average has caused a fatality [3]. Another finding proved that several cases of complications of hyperbilirubinemia have caused kernel jaundice and bilirubin encephalopathy [4]. A prevention can be done if the causative factors have been identified in advance. An increase in bilirubin levels is due to several factors such as gestational age, birth weight, type of delivery and blood type [5]. Another study only mentioned two factors, type of delivery and the sex of the baby [6]. Based on the description of the problem, it is necessary to conduct research to determine

the factors associated with the incidence of hyperbilirubin. It was conducted in the Perinatology Room of Banyumas Hospital.

2. RESEARCH METHOD

This is a quantitative study using a design of retrospective cohort study. The population in this study was all babies with hyperbilirubin in the Perinatology Room at Banyumas Hospital in January-December 2018. There were 486 babies. The method of data collection was by observing the patient's medical records. To determine the sample it was used a simple random sampling technique, it gave 83 respondents. The independent variable is the type of delivery, birth weight, gestational age, sex and asphyxia, and the dependent is the occurrence of hyperbilirubin. The instrument used in this study was the observation sheet. The data analysis employed chi square test and multiple logistic regression.

3. RESULTS AND DISCUSSIONS

3.1. Bivariate analysis

Table 1. The relationship between type of delivery, birth weight, gestational age, sex and asphyxia with the incidence of hyperbilirubin

Variable	Hyperbilirubin incidence				Total		p-value
	Hyperbilirubin		Non-hyperbilirubin		n	%	
	f	%	f	%			
Type of delivery							
Labor with treatment	36	83.7	23	57.5	59	77.1	0,008
Normal labor	7	16.3	17	42.5	24	28.9	
Birth weight							
Low birth weight	19	44.2	8	20.0	27	32.5	0,019
Normal Birth weight	24	55.8	32	80.0	56	67.5	
Gestational age							
Preterm	23	53.5	6	15.0	29	34.9	0,000
Aterm	20	46.5	34	85.0	54	65.1	
Sex							
Male	30	69.8	21	52.5	51	61.4	0,106
Female	13	30.2	19	47.5	32	38.6	
Asphyxia							
Asphyxia	14	32.6	4	10.0	18	21.7	0,013
Non asphyxia	29	67.4	36	90.0	65	78.3	
Total	43	100	40	100	83	100	

The results show that of the 59 respondents of delivery with treatment, most of them (36) had babies with hyperbilirubin, while of the 24 respondents with normal labor, mostly (17) had non-hyperbilirubin babies. This partly corresponds with another study which indicates that the chance that a baby will experience hyperbilirubinemia if the mother experiences a non-spontaneous type of labor and the baby is born prematurely is 99%. It means the delivery with treatment partly contribute for the case of hyperbilirubin [7]. Based on the statistics test, it obtained a p-value of 0.008 (<0.05), indicating there is a relationship between the type of labor and the incidence of hyperbilirubin in infants. This factor is also mentioned in another study (Novie and Ade, 2010); another factor indicated to be associated with the case is gestational age. It is explained further that babies born with treatment may not immediately cry at birth. The delay in crying results in hemodynamic abnormalities so that respiratory depression can cause hypoxia throughout the body resulting in respiratory/metabolic acidosis which then can interfere with bilirubin metabolism [8].

The data show that of the 27 respondents with low birth weight, 19 respondents had a case of hyperbilirubin, while among 56 respondents with normal birth weight, most (32 respondents) of them did not go with the case. A similar result is seen in another study [9], showing that out of 20 respondents with LBW, a small proportion of respondents, only 1 (5.0%) experienced physiological jaundice and 19 others (95.0%) underwent a pathological jaundice. LBW conditions cause the imperfect liver maturation (liver immaturity). Thus, the conjugation of indirect bilirubin to direct bilirubin in the liver is imperfect. The chi square test gave a p-value 0.019 (<0.05), meaning that there is a relationship between birth weight and the incidence of hyperbilirubin in infants. This finding is in line with the results of research, proving a relationship between infant birth weight ($P = 0.0001$) and hyperbilirubinemia. [10] This also supported another study [5] that babies with low birth weight are due to immature hepatic function or liver function disorders such as hypoxia, hypoglycemia, acidosis, etc., resulting in increased bilirubin levels.

The data show that of the 29 respondents with preterm gestational age, 23 of them had the hyperbilirubin case. Meanwhile, among 54 respondents who were at term, the majority (34 respondents) did not get the case. This is in line with another study showing that babies with preterm gestation (<37 weeks), more than a half (52.3%) experienced hyperbilirubin, while most babies with at term gestation (37-42 weeks), 71.5%, do not have hyperbilirubin. [11] The chi square test obtained a p-value of 0.000 (<0.05). It indicates a relationship between gestational age and the incidence of hyperbilirubin. The result is in line, that there is a relationship between gestational age and the incidence of neonatal jaundice [12]. This supports another research emphasizing that the incidence of neonatal jaundice in term infants (term) reaches 50% and in preterm (preterm infants), it is 58%. [3]

It shows that of the 51 respondents with male babies, most of them (30 respondents) were with hyperbilirubin. Among 32 respondents with female babies, 19 babies did not have hyperbilirubin. This supports another study reporting that 68% of hyperbilirubinemia cases occurred in male infants [13]. The chi square test obtained p-value 0.106 (> 0.05), saying that no certain sex does associate with the incidence of hyperbilirubin. It can happen equally in male and female babies. The result accords to another study emphasizing no association of the sex of the baby and the incidence of neonatal jaundice [14].

The result of the research shows that of the 18 respondents with asphyxia, most of the babies (14 respondents) were with hyperbilirubin. Meanwhile from the 65 respondents with no asphyxia, most of their babies did not have any hyperbilirubin case. Neonatal risk factors that influence the incidence of neonatal jaundice are babies born with a history of asphyxia. This condition is caused by a lack of oxygen intake in the organs of the neonate, so that the function of the organs is not optimal. Asphyxia can also result in changes of liver function. This will lead to a lack of oxygen in the liver which can cause a jaundice in the long term and even a death in the short term [15]. Based on the results of the analysis, it shows a p-value 0.013 (<0.05), saying that there is a relationship between asphyxia and the incidence of hyperbilirubin. This is in line with another study proving that statistically there is a significant relationship between the incidence of asphyxia and neonatal jaundice [16].

3.2. Multivariate analysis

Table 2 The factor mostly-associated with the incidence of hyperbilirubin

Variable	B	S.E.	P value	Odds ratio	95% C.I.for EXP(B)	
					Lower	Upper
Asphyxia	1.120	.679	0.099	3.065	.810	11.593
Gestation age	1.389	.629	0.027	4.011	1.169	13.767
Birth weight	.437	.640	0.495	1.548	.442	5.423
Type of delivery	1.029	.571	0.072	2.798	.914	8.568
Constant	-6.495	1.808	0.000	.002		

The factors mostly related to the incidence of hyperbilirubin Based on the results, it shows that the factor that mostly influences the incidence of hyperbilirubin is gestational age with a p-value of at least 0.027 and the greatest odds ratio of 4.011. The odds ratio indicates that gestational age has a greater chance than other variables by 4.011 times to cause hyperbilirubin. This finding supports another study, which proved that the risk factor that affects the occurrence of hyperbilirubinemia is gestational age. It also shows that gestational age has a 4 times chance of causing hyperbilirubin. This explains that the less gestational age, the greater the risk of causing hyperbilirubin [17]. Postterm gestational age has a higher risk of causing complications than at term gestation. [18] Explains that premature babies have a 6.319 times greater chance of experiencing neonatal jaundice than at term babies. In premature babies there is immaturity of the liver which causes conjugation and impaired excretion of bilirubin, causing jaundice. Lack of the enzyme glucorinyl transfer causes the conjugation of indirect bilirubin to direct bilirubin is not yet complete and the level of blood albumin which plays a role in the transport of bilirubin from the tissue to the liver are low.

4. CONCLUSION

Based on the analysis, it can be concluded that the factors causing hyperbilirubin in babies are type of delivery, birth weight, gestational age, and asphyxia. It is also proved that the sex of the baby has no association with the incidence of hyperbilirubin. Among the factors the gestational age the most important contributor for the case by 4 times compared to other variables under this inquiry.

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