Neonatal Jaundice Causal Factors: A Literature Review

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ABSTRACT

Background: Jaundice (neonatal icterus), known as yellowish baby is a condition where the yellowing of the skin and sclera in newborns, due to increased levels of bilirubin in the blood (hyperbilirubinemia) which subsequently causes an increase in bilirubin in the fluid outside the cell (extracellular fluid). Jaundice is one of the contributors to infant morbidity in Indonesia because it can cause the baby's body to become limp, unwilling to suck, increased muscle tone, stiff neck, muscle spasms, convulsions, sensory disturbances, mental retardation, disability, and even death.

Objective: This study aimed to review the evidence related to the factors causing jaundice in neonates.

Method: This research method was a literature review study. Journal searches were carried out by applying online database such as ScienceDirect and PubMed. Author also used google scholar for search engine. The inclusion criteria in this study were journals published in 2015-2020 using Indonesian and English and full text. Journal search results obtained as many as 10 journals were reviewed in this study.

Results: Birth weight of the baby, gestational age, asphyxia, infection, length of labor, frequency and sex are factors that cause jaundice while primiparous mothers are factors that do not cause jaundice. Based on the results of the review of the article the researchers found that there were gaps in the study this is research on the factors causing the occurrence of jaundice more focused on health problems of birth weight of the baby, gestational age, asphyxia, and infection, duration of delivery, frequency and sex. Only few researches are examining the factors associated with factors causing jaundice in neonates.

Conclusion: The factors causing the occurrence neonatal jaundice are more focused on health problems of birth weight of babies, gestational age, asphyxia, infection, length of labor, frequency and sex. There are still few studies that examine the factors associated with factors that cause jaundice in neonates.

Keywords: *Mother factor, Baby factor, Jaundice, Neonatal Icterus*

BACKGROUND

The infant mortality rate (IMR) in Indonesia has reached 22 deaths per 1,000 live births, and the mortality rate for children under five years of age (AKBA) is 26 per 1,000 live births. The primary causes of IMR in the nation include asphyxia (37%), prematurity (34%), sepsis (12%), hypothermia (7%), jaundice (5%), post-maturity (3%), and congenital anomalies (1%), as reported by SUPAS in 2015. Although jaundice does not represent the leading cause of infant mortality, it significantly contributes to infant morbidity in Indonesia. It can deteriorate an infant's health condition, leading to difficulties in feeding, increased muscle tone, rigidity of the neck, muscle spasms, seizures, sensory impairments, cognitive delays, disabilities, and potentially fatal outcomes (Amandito et al., 2018).

Neonatal jaundice, also known as icterus neonatorum, manifests as a yellow tint in body tissues of newborns due to elevated hyperbilirubinemia levels, resulting in increased bilirubin in the extracellular fluid (Govoni et al., 2019). The occurrence of neonatal jaundice is influenced by various factors including ethnicity, Rh disease, ABO blood group incompatibility, maternal age, socioeconomic status, being a first-time mother, family history of jaundice, low birth weight, prematurity, and insufficient breastfeeding (Kyu et al., 2018; Olusanya et al., 2015). While a rise in bilirubin is a common transitional phase in newborns, excessive levels pose a severe risk of kernicterus, necessitating prompt and specialized care to avert mortality (Tani & Castagna, 2017).

Midwives play a crucial role in the prevention and early detection of pathological jaundice through health education to expectant mothers about dietary requirements and the significance of exclusive breastfeeding. They are tasked with advising mothers on recognizing jaundice symptoms and effective home care practices, such as adequate breastfeeding and early morning sun exposure for the infant. Should these measures not yield improvement, mothers are advised to seek professional healthcare services (Maryunani, 2013).

Delayed feeding significantly contributes to the development of jaundice by exacerbating physiological jaundice's intensity, particularly in premature infants. Newborns whose mothers have low milk production or are in intensive care and unable to provide colostrum immediately post-birth accumulate excessive bilirubin, leading to jaundice. Colostrum is known for its laxative properties, facilitating the expulsion of the newborn's initial feces, which contains excess bilirubin (Otsuka et al., 2008). The community's perception of jaundice as a grave condition is evident from mothers' inquiries about their newborns' health status regarding jaundice, highlighting the anxiety and special care required for affected infants.

The Birth Planning and Complication Prevention Program (P4K) has been instrumental in improving proxy indicators, such as births attended by healthcare professionals, to reduce both maternal and infant mortality rates. This program also promotes antenatal care, healthcare-assisted childbirth, postnatal care, and newborn care. It encourages practices such as Early Breastfeeding Initiation (IMD) and exclusive breastfeeding for the first six months to ensure optimal infant health (Ministry of Health, 2013).

OBJECTIVE

The objective of this investigation centers on systematically examining the evidence surrounding the causative factors of neonatal jaundice. It provides complex

etiological landscape of neonatal jaundice, within global context which could contribute to the global body of knowledge on neonatal care, emphasizing evidence-based strategies for preventing, detecting, and treating jaundice in newborns.

METHODS

This investigation was structured around a narrative review methodology, which is characterized by the collection and critical examination of library data to address a specific research problem, grounded in an extensive understanding of relevant scholarly materials (Anwar et al., 2015; Rahman et al., 2018). Opting for a narrative review allowed for the assimilation of eligible sources into a comprehensive summary that encapsulates the latest theoretical insights and empirical findings related to the study's focus (Cisco, 2014).

The narrative review embarked with the establishment of precise review questions. These questions were pivotal in guiding the search and analysis of literature, ensuring that the review remained aligned with the study's aims and objectives. Following this initial stage, a systematic search was undertaken to identify articles pertinent to the causes of neonatal jaundice. This search spanned several databases and sources, aiming to amass a broad collection of literature for potential inclusion in the review.

Subsequently, the process of article selection was undertaken, adhering to strict inclusion criteria. These criteria mandated that articles be published within the last five years, embracing both English and Indonesian languages, to ensure the review's topical relevance and accessibility. The focus was narrowed to original articles examining neonates and specifically addressing the factors contributing to neonatal jaundice. This selective approach was essential in curating a body of literature that was both relevant and manageable for detailed analysis.

Once relevant articles were identified, the next phase involved the systematic extraction and organization of data from the selected studies. This step was crucial for distilling the vast array of findings and theories into a coherent body of evidence that could be further analyzed and understood in relation to the study's research questions.

The culmination of this meticulous process was the compilation, summarization, and reporting of the review's findings. This final stage synthesized the collected data, drawing together key insights to provide a nuanced understanding of the factors causing neonatal jaundice. Through this narrative review, the study aimed to contribute a comprehensive and up-to-date perspective on the subject, informed by a critical analysis of the most recent and relevant literature available.
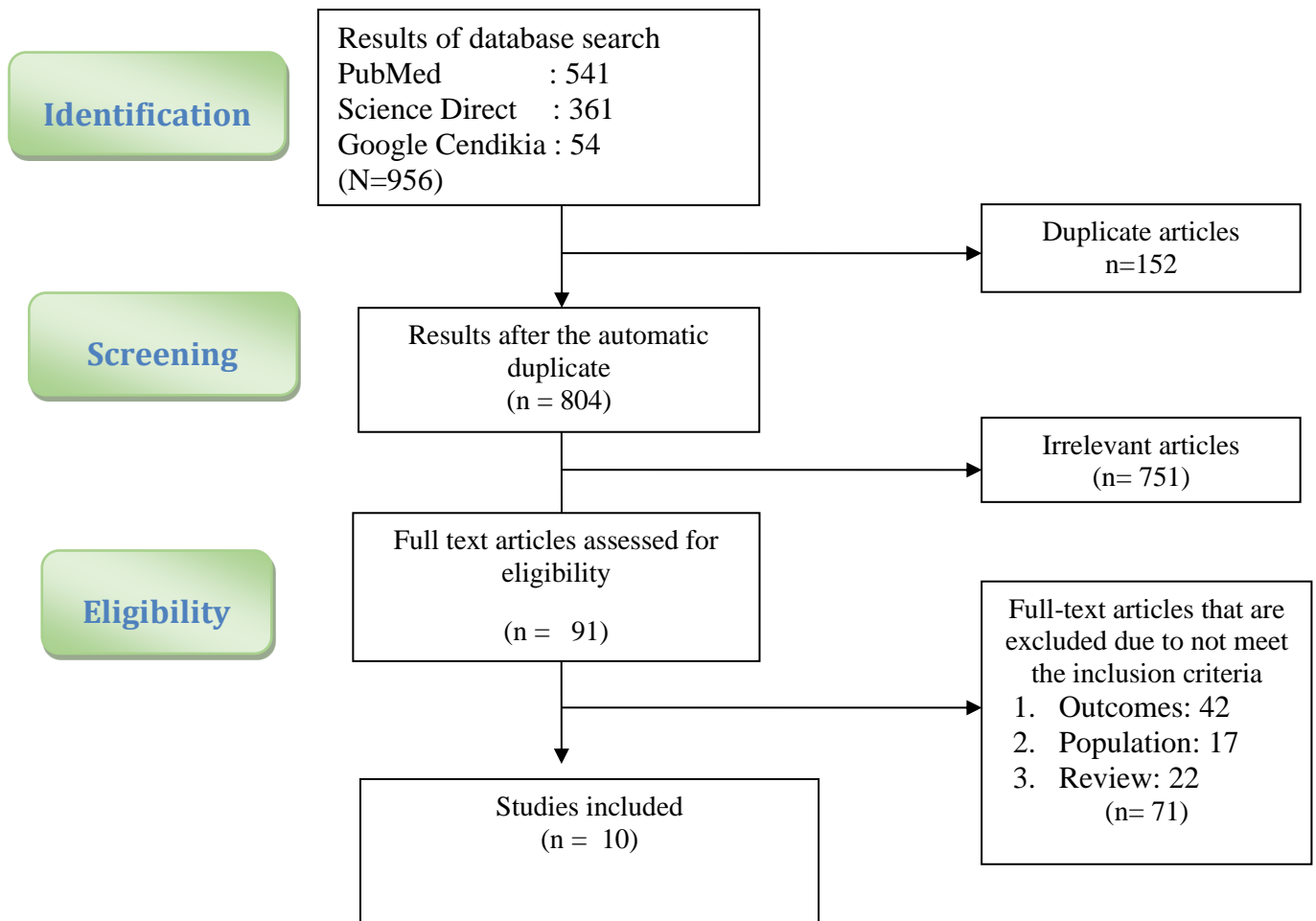
RESULTS

Birth weight of the baby, gestational age, asphyxia, infection, length of labor, frequency and sex are factors that cause jaundice while primiparous mothers are factors that do not cause jaundice. Based on the results of the review of the article the researchers found that there were gaps in the study this is research on the factors causing the occurrence of jaundice more focused on health problems of birth weight of the baby, gestational age, asphyxia, and infection, duration of delivery, frequency and sex. Only few researches are examining the factors associated with factors causing jaundice in neonates.

No	Title/Author/ Year	Country	Objective	Method	Result
1.	Factors Causing Neonatal Jaundice in the NICU	Indonesia	To identify factors causing neonatal	Quantitative study with descriptive design. Checklist	Of the total 46 samples, the majority of LBW <2500 gr were 26 people (56.5%), Premature Infants <37 weeks

	Room at Arifin Achmad Hospital, Riau Province/ Febrianti Maharani/ 2016.		jaundice in the NICU room at Arifn Achmad hospital, Riau Province in 2016.	sheets and secondary data. The population is all data on jaundice in newborns in the NICU room at Arifin Achmad Hospital, Riau Province with a total of 46 cases and 46 samples	reached 18 people (39.1%) and the breastfeeding factor was 2 people (4.4%). These results are expected as input for agencies to improve their efforts to provide bucket c services and light therapy for jaundice babies.
2.	The Relationship between Perinatal and Neonatal Factors on the Incidence of Neonatal Jaundice / Dwi Yuliawati, Reni Yuli Astutik / 2018	Indonesia	To determine the relationship between perinatal and neonatal factors on the incidence of neonatal jaundice at Kediri District Hospital	A correlation study with a retrospective cohort design. Using simple random sampling technique. The population in this study were all infants with jaundice at Kediri District Hospital in January - December 2016 with a total of 61 infants. The sample was 54 respondents.	The results showed that there was a relationship between birth weight (p= 0.018; POR 0.085 95% CI 0.10-0.713), gestational age (p= 0.044; POR= 0.202 95% CI 0.049-0.836), and perinatal complications (p= 0.031; POR = 4.714 95% CI 1.250-17.784). on the incidence of neonatal jaundice and there was no relationship between gender (p = 0.441; POR = 0.503 95% CI 0.143-1.767) and the incidence of neonatal jaundice in Kediri District Hospital. It is maybe due to other factors. LBW conditions, prematurity, male sex, perinatal complications (asphyxia/sepsis/cephalhematoma) lead to the occurrence of pathological jaundice in infants.

3.	The Effect of Low Birth Weight on the Neonatal Jaundice Incidence in Sidoarjo/ Ndaru Puspita/ 2018	Indonesia	To identify the effect of LBW on the incidence of neonatal jaundice at Sidoarjo Hospital.	Cross sectional study. Using simple random sampling technique. The population was all newborns in the neonatal room at Sidoarjo Hospital with a total of 190 infants. The sample was determined using the Slovin formula obtaining 129 samples.	This study showed that the incidence of LBW was 21.71% and the incidence of neonatal jaundice was 29.46%. LBW babies who experienced neonatal jaundice reached 17.80%. The results of the chi square analysis obtained a value of p = 0.01 (p <0.05) which means that LBW influences the incidence of neonatal jaundice at Sidoarjo Hospital.
4.	Factors Associated with Jaundice in Neonates/Siti Rohani, Rini Wahyuni/2017	Indonesia	To identify factors associate with the incidence of jaundice in neonates.	A cross sectional study. Using a systematic random sampling technique. The population was 1041 neonates with the sample of 196 neonates.	The results of the chi square test showed a relationship between birth weight (p-value 0.000 <0.05), OR= 3.084, and gestational age ((p was related to infection (p-value 0.005 <0.05), OR= 2.444, asphyxia (p has no relationship to the type of delivery (p multiple bucket c regression). The gestational age was the most dominantly related to the incidence of jaundice in neonates (p-value 0.000), OR = 4.698. At least 4 visits of EFA to pregnant women can prevent infection.

| 5. | Prevalence of and mothers' knowledge, attitude and practice towards glucose-6-phosphate dehydrogenase deficiency among neonates with jaundice: a cross-sectional study/ Zeinab A Kasemy, Wael A Bahbah, Sally M El Hefnawy, Safa H Alkalash/2019 | Mesir | To estimate the prevalence of G6PD deficiency among neonates with jaundice and to assess maternal perceptions of G6PD and NNJ. | A cross-sectional study. The data collected covered the characteristics of mothers and newborns. Laboratory investigations included serum bilirubin, reticulocyte count, ABO grouping, Rh typing and neonatal serum G6PD test. Mothers were interviewed individually using a structured questionnaire to assess their perceptions of G6PD deficiency and NNJ. 487 neonates with indirect hyperbilirubinemia from June 2018 to July 2019 in Egypt | The prevalence of G6PD deficiency reached 10.10%. Neonates with G6PD deficiency showed higher serum bilirubin levels ($p < 0.001$). Male gender, family history of G6PD deficiency and relatives become risk factors for G6PD deficiency (OR = 4.27, 95% CI 1.66 – 10.99; OR = 9.54, 95% CI 4.80-18.95; OR = 10.219, 95% CI 5.39 – 19.33, respectively). Mothers' perceptions about NNJ and G6PD were low, namely 30% for MNJ and 17.10% for G6PD. Respondents have a positive attitude towards NNJ (46.8%) and G6PD deficiency (45.0%), with a good practice of NNJ (29.9%) and G6PD deficiency (19.9%). |
| 6. | Knowledge Level and Determinants | Ghana | To identify factors | A case control study with a | The majority of the respondent (54%) born together had a pregnancy |

of Neonatal Jaundice: A Cross-Sectional Study in the Effutu Municipality of Ghana/ Prince Adoba, Richard K.D.Ephraim, Kate Adoma kowaah Kontor, Joseph-Josiah Bentsil, Patrick Adu, Maxwell Anderson, Samuel Asamoah Sakyi, and Paul Nsiah/2018		associated with neonatal jaundice and assess the level of knowledge of mothers about this condition	cross-sectional design. Using a well-structured questionnaire to collect maternal and child histories data. One hundred and fifty (150) neonates consisting of 100 with clinically proven jaundice and 50 without jaundice in Trauma and Specialist Hospital in Effutu City were invovled in this study	1 – 3 days after birth with 10% with a postpartum period. Duration of labor and pregnancy at birth with body weight <0.05). G6PD abnormalities were found in 11 (12%) neonates with jaundice. and ABO incompatibility was found in 18%. neonates born to mothers with formal employment and those who had a long labor were significantly more likely to have neonatal jaundice (OR = 4.174, P = 0.003; OR = 2.389, P = 0.025, resp.). more likely to develop neonatal jaundice (OR = 2.347, P = 0.044). Only 17.3% of mothers had heard of neonatal jaundice. School becomes the main source of information formation about neonatal jaundice (34.6%). The majority of participants did not know that NNJ can cause damage to other organs in the body (90%).
7.	Meconium microbiome associates with the development of neonatal jaundice/Tian yu dong et all/2018	China	to identify the meconium microbiome in newborns and to check its association with risk of neonatal jaundice.	A case control study The population was taken from the NMU Mother and Child Cohort Study (Phase II), a prospective cohort	The logistic regression model showed that higher variability was significantly associated with a lower risk of jaundice in babies born by cesarean section (OR 0.72, 95% CI 0.52-0.98), but not in babies born spontaneously. A relative abundance of Biobobobium pseudolongum in newborn meconium was

				designed to study prenatal risk factors on pregnancy outcomes and child health. Participants in this study were mother-infant pairs recruited in early pregnancy from hospitals affiliated with Nanjing Medical University between February 2014 and November 2015. 301 newborns with meconium samples from 2014 to 2015.	significantly associated with a lower risk of jaundice both in infants born by cesarean section and in total subjects (OR 0.24, 95% CI 0.07–0 .68; OR 0.55, 95% CI 0.31-0.95, respectively). Spearman's correlation showed that the relative abundance of B. Pseudolongum was significantly correlated with α-diversity (P < 0.01).
8.	Breastfeeding during breast milk jaundice – a pathophysiological perspective/ Prameela Kannan Kutty,	Malaysia	To identify whether breastfeeding affects the incidence of jaundice.	Literature review. Reviewing the literature and integrating relevant information concerning neonatal jaundice, entry of	Some substances in breast milk may be responsible for jaundice but continuous breastfeeding provides many benefits. Breastfed infants benefit from fewer infections, increased organ and physiological maturation, and the prospect of genetic modification of

	FRCP (Edin), FRCPCH (UK)/2019			bilirubin into the immature brain and how breastfeeding affect neonatal jaundice	certain diseases. This beneficial measure may also reduce the risk of early jaundice and its complications. The holistic integration of knowledge clarifies the overall benefits of continues breastfeeding. Breastfeeding jaundice may reflect a holistic expression of tissue protection and increased neonatal survival
9.	Indirect neonatal hyperbilirubinemia in hospitalized neonates on the Thai-Myanmar border: a review of neonatal medical records from 2009 to 2014/ L. Thielemans et al/2018	Thailand	To describe neonates with INH, the burden of severe INH and factors associated with severity in resource-limited setting	Retrospective evaluation of anonymized records of neonates treated at the Thai-Myanmar border. Anonymized records of neonates treated at the Thai-Myanmar border	A total of 2980 records were reviewed and found that 1580 (53%) had INH within the first 14 days of life. INH was moderate in 87% (1368/1580) and severe in 13% (212/1580). From 2009 to 2011, the proportion of severe INH decreased from 37% to 15% and mortality declined from 10% (8/82) to 2% (7/449) with the adoption of standard guidelines and light-emitting diode (LED) phototherapy. Severe INH is associated with: prematurity (<32 weeks), Adjusted Odds Ratio (AOR) 3.3; 95% CI 1.6-6.6 and 32 to 37 weeks, AOR 2.2; 95% CI 1.6-3.1), Glucose-6-phosphate dehydrogenase deficiency (G6PD) (AOR 2.3; 95% CI 1.6-3.3.3), potential ABO mismatch (AOR 1.5; 95% CI 1.0-

					2.2) and late presentation (AOR 1.8; 95% CI 1.3-2.6). The risk of developing severe INH and INH-related mortality increases significantly with each additional risk factor.
10.	Relationship between Neonatal Skin Bilirubin Level and Severe Jaundice with Maternal, Childbirth, and Neonatal Characteristics / Robabe Seyedi et al/2019	Iran	to test for various maternal, labor, and neonatal factors affecting neonatal skin bilirubin levels and severe jaundice	A cross-sectional study. Using a convenience sampling technique. This study involved 1066 healthy neonates with gestational age of 35 weeks or more and birth weight of $\geq$ 2000 g at Alzahra and Taleghani hospitals in Tabriz, Iran, during 2016-2017. Data were collected using a three-part questionnaire that assessed maternal, childbirth and neonatal characteristics based on the medical	Of the total neonates followed up, 94 (9.96%) cases developed severe jaundice and 850 (90.04%) newborns did not show any symptoms of this complication. The adjusted general linear model results showed that the infant's bilirubin level was significantly correlated with a history of jaundice in previous children, the infant's age at first meconium excretion, the frequency of feedings, the gestational age, the mother's blood type, and the number of maternal ultrasounds check during pregnancy. Besides, the adjusted logistic regression results revealed an association between severe jaundice and variables like residence, history of jaundice in previous children, feeding the infant with water or sugar water during the feeding interval, frequency of feeding the infant, gestational age, mother's blood type, time of discharge from hospital, and number of pregnancies.

	history of the mother and newborn and interviews with the mother.

DISCUSSION

1. Factors associated with jaundice
   a. Babies with low birth weight associated with jaundice

   Babies with low birth weight have a higher risk of infection because of decreased maternal immunoglobulin reserves, impaired ability to form antibodies, and damaged integumentary system (thin skin and weak capillaries). Hypoglycemia in premature infants and those with growth disorder have lower glycogen stores so they cannot mobilize glucose as fast as normal-term babies. Premature babies have immature hormone and enzyme responses. Hyperbilirubin is also caused by hepatic maturity factors so the indirect bilirubin conjugation to direct bilirubin has not been perfect. Jaundice can be worsened by polycythemia, hemolysis bruises, and infection as hyperbilirubin can cause kernicterus so that the baby's skin color and bilirubin must be frequently recorded and checked if it appears early or turns to brown faster (Thielemans et al., 2018; Yuliawati & Astutik, 2018).

   b. Gestational age associated with jaundice

   Jaundice is more common in premature babies and babies with low birth weight. This is in line with (Yuliawati & Astutik, 2018) that there is a relationship between gestational age and the incidence of jaundice in newborns. (Puspita, 2018; Seyedi et al., 2019) explains that the gestation period is the most dominant aspect of the incidence of jaundice. This means that gestational age is a risk factor for the incidence of hyperbilirubin in newborns as gestational age is an important factor that determines the health of the baby. Early-term babies are associated with low birth weight which can affect the baby's immune system which is not ready to accept and adapt to the environment outside so they have the potential for various complications including jaundice.

   c. Asphyxia associated with jaundice

   This is in line with the results of a previous study by (Mubasyiroh et al., 2017) that there is a relationship between asphyxia and jaundice. Asphyxia is caused by impaired oxygen transport during pregnancy or childbirth. If this continues, it can cause anaerobic metabolism in the form of glycolysis of body glycogen resulting in the reduction in glycogen in the liver which leads to jaundice (Dong et al., 2018; Septianingrum & Yasintha, 2018) reveals that there is a relationship between asphyxia and jaundice. Babies with asphyxia have a risk of 2.88 times experiencing physiological jaundice. This hypoxia is associated with factors emerging in pregnancy, childbirth, or post-partum. The impact of asphyxia will be worse without proper handling. Actions are taken to maintain the baby's survival and limit possible further symptoms.

d. Infection associated with jaundice

This is supported by (Olusanya et al., 2015) that congenital infections can affect the intrahepatic or extrahepatic portal vein which will cause an increase in bilirubin leading to jaundice. The infected babies may have mild conjugated hyperbilirubinemia. Another stigma of congenital infection may be involved especially, in the case of bacterial infection which leads to elevated bilirubin levels. The use of antibiotics and influenza drugs can cause liver dysfunction in babies so that the baby's liver cannot optimally dissolve bilirubin into the water to be transported into bile and excreted into the intestine to become urobilinogen. This causes an increase in the level of bilirubin in the plasma resulting in jaundice.

Length of Labor and Jaundice Incidence. Jaundice is not only caused by the baby factor but also the length of the labor. G6PD abnormalities were found in 11 (12%) neonates with jaundice and ABO incompatibility (18%). Babies born to mothers with formal employment and prolonged labor were significantly more likely to have jaundice (OR = 4.174, P = 0.003; OR = 2.389, P = 0.025, respectively) and more likely to develop jaundice (OR = 2.347, P = 0.044). Only 17.3% of mothers had heard of jaundice.

Prolonged labor is caused by wrong pushing, premature rupture of membranes, fetal factors, abnormalities and a narrow pelvis (Nuraeni et al., 2018).

e. Gender associated with jaundice

The results of this study indicate that gender is related to the incidence of jaundice because baby boys have a higher risk of jaundice than baby girls due to some factors, such as the prevalence of Gilbert's syndrome (a genetic disorder of bilirubin conjunctions) which is reported higher than in girls and a deficiency of G6PD which is the most common disorder of enzyme and is associated with sex chromosomes (x-linked) which generally manifests in males only (Battersby et al., 2018).

f. Mother's knowledge related to the incidence of jaundice

The results in this study that maternal knowledge is related to the incidence of icterus because low maternal knowledge about neonatal jaundice can cause a very large risk to ignore predisposing factors that might be avoided and even signs that require immediate jaundice treatment in newborns make them develop jaundice and are often admitted to health facilities when irreversible neurotoxicity and brain damage may have occurred (Hashim et al., 2020).

g. Meconium bacteria are associated with jaundice

The results of this study that meconium microbes are associated with the incidence of jaundice only applies to cesarean delivery due to delays in early breastfeeding (Fox et al., 2015; Kutty, 2019). The study also explained that bacteria in the gut have an important role in mediating bilirubin in neonates.

2. Factors that are not associated with jaundice
   a. Primipara mothers are not associated with jaundice

   Primipara mothers do not cause jaundice. This is explained in the third article that the incidence of low birth weight and jaundice reach 21.71% and 29.46% respectively. Babies with low birth weight who has jaundice reach 17.80%. The results of the chi-square analysis obtained a p-value of = 0.01 (p <0.05) which means that low birth weight influences the incidence of jaundice at Sidoarjo Hospital.

b. Types of birth delivery is not associated with jaundice

The type of birth delivery does not cause jaundice. This is explained in the 4th article that the chi-square test showed that there was a relationship between birth weight (p-value $0.000 < 0.05$), OR = 3.084, gestational age (p relationship with infection (p-value $0.005 < 0, 05$), OR = 2.444, and asphyxia (p no relationship with the type of delivery (p multiple logistic regression showed that the gestational age variable is the most dominantly associated with jaundice (p-value 0.000), OR = 4.698. At least 4 times PUS visits to pregnant women can prevent infection. Babies born by vacuum and forceps extraction have a tendency to have closed bleeding in the head, such as caput succedaneum and cephalohematoma which are risk factors for hyperbilirubinemia in jaundice. However, not all birth deliveries experience jaundice (Damarini et al., 2013).

The statistical tests showed no relationship but this study indicated that Section Cesarean and vacuum extraction causes the risk of pathological jaundice. There was no relationship in this study because the incidence of jaundice is caused by many factors, including uncontrolled factors. Control factors cover prematurity, infection and cephal haematoma, while uncontrolled factors cover asphyxia, hypoalbuminemia, diabetes mellitus in mothers and breast milk jaundice.

CONCLUSION

In summarizing the findings, it is evident that various factors contribute to the occurrence of jaundice in neonates, encompassing birth weight, gestational age, asphyxia, infection, length of labor, frequency, mother's knowledge, meconium microbe, and gender. Notably, primiparous status in mothers does not emerge as a contributing factor to neonatal jaundice.

Despite the valuable insights gained from the reviewed articles, certain gaps in the existing body of literature warrant attention. Firstly, the emphasis in research on the causes of jaundice has predominantly focused on health issues related to birth weight, gestational age, asphyxia, infection, length of labor, frequency, mother's knowledge, meconium microbe, and gender. While these factors undoubtedly play crucial roles, there is a need for a more comprehensive understanding that explores the intricate interactions among these variables and their cumulative impact on neonatal jaundice.

Furthermore, a notable gap identified in this study pertains to the scarcity of research examining the factors associated with the identified causes of jaundice in neonates. It is imperative to delve deeper into the intricate interplay between these factors, exploring how they synergistically contribute to the onset of jaundice. This avenue of research holds the potential to unravel nuanced patterns and provide a more holistic understanding of neonatal jaundice etiology.

In conclusion, the findings underscore the complexity of neonatal jaundice causation, necessitating a multifaceted approach in both research and clinical practice. Addressing the identified gaps by fostering research that explores the interrelations among these factors can enhance our understanding of neonatal jaundice, ultimately informing more effective preventive and management strategies. Future research

endeavors should strive to bridge these gaps, offering valuable insights that contribute to the improvement of neonatal care and outcomes.

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