# The Effect of Oksitosin Induction Management on Preeclampsia to the Hyperbilirubinemia Incidence : Case Report

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**ABSTRACT**

Around 3% of 120 million newborns experience neonatal jaundice Every year. It was estimated that the condition affects at least 481,000 babies and causes approximately 114,000 deaths globally. Case report: A 33-year-old woman P3A0 with pregnancy complications of preeclampsia gave birth to her 3rd child by oksitosin induction at 36/37 weeks gestational age. The mother has received continuity of midwife care since 22/23 weeks of pregnancy. On the 6th day after birth, the baby experienced Kramer IV neonatorum jaundice and it was then referred to the hospital. The results of total bilirubin examination at the hospital were 24 mg/dl. The parents received counseling by telehealth and home visits about on breast milk expressed, parent support, counseling parents regarding the nutritional and fluid adequacy of providing on-demand breast milk without formula milk mixture, personal hygiene, and thermoregulation. Conclusion: The management of pregnancy complications using oksitosin induction was considered to have an impact on neonatal outcomes, such as neonatal jaundice. So, it was recommended to do it carefully by considering the benefits compared to the risks. Because hyperbilirubinemia management aims to reduce morbidity, disability, and mortality.

## INTRODUCTION

According to UNFPA and WHO (2019), approximately 8 million women worldwide experience pregnancy-related complications each year, resulting in over half a million maternal deaths—99% of which occur in developing countries. In contrast, the maternal mortality rate due to pregnancy and childbirth complications in developed nations is significantly lower, estimated at 1 in 5,000 women, compared to 1 in 11 in developing countries (POGI, 2016).

World Health Organization (WHO, 2024) identifies high blood pressure during pregnancy—commonly known as preeclampsia—as one of the most frequent and dangerous complications contributing to maternal



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mortality. This condition affects approximately 2% to 15% of pregnancies globally and is responsible for nearly 75% of maternal deaths, accounting for more than 50,000 fatalities annually. In low-income countries, preeclampsia contributes to approximately 9% to 26% of maternal deaths, while in high-income countries the proportion is around 16% (Chang, Seow, & Chen, 2023).

Shahd and Peter (2023) have outlined several risk factors associated with preeclampsia, including nulliparity, multiple pregnancies, advanced maternal age (above 35 years), conception through in vitro fertilization (IVF), and pre-existing maternal conditions such as chronic hypertension, chronic kidney disease, diabetes mellitus, thrombophilia, obstructive sleep apnea, and obesity (defined as a pre-pregnancy BMI >30). Other contributing factors include a family history of preeclampsia, a previous history of preeclampsia or placental abruption, and intrauterine fetal growth restriction.

Preeclampsia requires immediate medical attention to prevent severe maternal and neonatal outcomes. According to POGI (2016), if preeclampsia occurs at 37 weeks of gestation without severe symptoms, labour should be initiated promptly. One of the recommended approaches is induction of labour using oxytocin (Osilla & Sandeep, 2023).

The prevalence of labour induction using oxytocin varies across regions and has been steadily increasing, nearly doubling in some developed countries. In the United States and the United Kingdom, approximately 20% of deliveries involve labour induction, with some institutions reporting rates as high as 40%. In Latin America, the rate is about 11.4%, while in Africa the average is considerably lower at 4.4% (Lueth, Kebede, and Medhanyie, 2020).

However, the use of oxytocin for labour induction is not without risks. Research has shown an association between oxytocin-induced labour and neonatal outcomes, particularly neonatal hyperbilirubinemia. Mothers who undergo labour induction with oxytocin contribute to approximately 16.1% of neonatal jaundice cases, while mothers with preeclampsia account for about 6.8% of cases (Belay *et al.*, 2023).

Neonatal jaundice, also referred to as hyperbilirubinemia, is a common

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condition observed in newborns during the first week of life as they transition from intrauterine to extrauterine life. While often benign and self-limiting, in severe cases it can become life-threatening. According to WHO (2022), around 3% of the 120 million annual live births worldwide—or approximately 3.6 million newborns—experience significant neonatal jaundice. Of these, it is estimated that at least 481,000 full-term or near-term infants suffer from severe jaundice, leading to approximately 114,000 deaths and more than 63,000 cases of moderate to severe neurodevelopmental disabilities (Fanello *et al.*, 2023). Additionally, Brits *et al.*, (2018) report that about 55.2% of healthy, full-term neonates experience some degree of jaundice.

Globally, WHO (2019) estimates that around 30 million newborns experience jaundice requiring hospitalization each year, with 8 to 10 million needing intensive care. Among the 120 million newborns affected by jaundice annually, approximately 481,000—both preterm and full-term—develop severe jaundice (with bilirubin levels >25 mg/dL). This results in an estimated 114,000 neonatal deaths and 63,000 survivors with moderate to severe long-term neurological impairments. Many of these cases require phototherapy and/or exchange transfusion. In Indonesia, the prevalence of neonatal hyperbilirubinemia is also concerning, with the Ministry of Health reporting an incidence rate of 51.47% among newborns (Indonesia health ministry, 2019).

According to Ansong *et al.*, (2023), neonatal hyperbilirubinemia, or neonatal jaundice, can lead to acute bilirubin-induced neurological dysfunction (BIND), which may initially manifest as acute bilirubin encephalopathy (ABE). If left untreated, ABE can progress to chronic bilirubin encephalopathy, or kernicterus—an irreversible condition that can result in choreoathetoid cerebral palsy, seizures, postural deformities, visual impairments, and sensorineural hearing loss. Additionally, infants with neonatal cholestasis are at increased risk for severe complications such as liver failure, cirrhosis, hepatocellular carcinoma, as well as growth failure and deficiencies in fat-soluble vitamins.

Importantly, most of neonatal deaths are preventable through timely and appropriate interventions. Evidence

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suggests that quality care at birth can prevent more than 40% of neonatal deaths. Essential interventions include care provided by trained midwives, access to emergency obstetric services, and comprehensive immediate newborn care—such as initiation of breastfeeding, thermal protection, hygienic cord care, and neonatal resuscitation. Additional life-saving measures include kangaroo mother care, the prevention and treatment of neonatal sepsis, effective management of neonatal jaundice, and the prevention of birth-related brain injury due to oxygen deprivation.

Continuity of care is a cornerstone of midwifery practice. It emphasizes holistic, person-centered care by fostering long-term, trusting relationships between midwives and families. Through sustained engagement during pregnancy, childbirth, the postpartum period, and early infancy, midwives play a pivotal role in safeguarding maternal and neonatal health. This continuity is facilitated through regular monthly home visits, support for antenatal checkups, postpartum and neonatal care—including immunization and family planning counselling—and the integration of telehealth services to ensure ongoing access to care and early detection of risk factors.

## CASE REPORT

A 33-year-old multiparous woman (P3A0) gave birth to her third child at the Women and Children's Hospital (RSWI) at 36/37 weeks of gestation. She had received continuous midwifery care starting at 22/23 weeks of gestation, including monthly follow-ups through a combination of home visits, community health center services, and telehealth support. During her initial follow-up visit, a history of complications in previous pregnancies and deliveries was documented. Her first delivery had involved complications and labour induction, while the second was complicated by preeclampsia and required induction.

According to the Maternal and Child Health (MCH) handbook, the mother had completed 10 antenatal care (ANC) visits during this third pregnancy, including an integrated ANC check-up at 9/10 weeks' gestation. At that time, her pre-pregnancy weight was 68 kg and her Body Mass Index (BMI) was 26.6 kg/m². Labour atory examinations revealed normal findings:

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hemoglobin level of 12.3 g/dL, blood type $A^+$, negative urine protein, and non-reactive results for HIV, HBsAg, and syphilis. Her initial blood pressure at 9/10 weeks was 110/70 mmHg, with a Mean Arterial Pressure (MAP) of 80 mmHg and a Roll Over Test (ROT) result of 10 mmHg. At 18/19 weeks' gestation, her blood pressure increased to 120/80 mmHg (MAP 93.3 mmHg), while the ROT remained unchanged. A decrease in blood pressure was noted at 28/29 weeks (120/70 mmHg), but it rose again at 34/35 weeks (120/82 mmHg) and continued to increase until delivery, reaching 150/90 mmHg at 36/37 weeks. Other clinical and labour atory monitoring results throughout the pregnancy were within normal limits, and her total weight gain was 13 kg.

At 36/37 weeks of gestation, the mother presented to the hospital due to persistent lower abdominal pain that began the previous day, without associated mucus or bloody show. Her blood pressure on admission was 148/94 mmHg. Given her obstetric history and elevated blood pressure, the clinical team recommended hospitalization for labour induction. Three rounds of vaginal induction were attempted, followed by intravenous oxytocin administration once cervical dilation reached 3 cm. Labour lasted approximately 23 hours.

The infant, a male, was delivered at 36/37 weeks' gestation. According to the MCH handbook, his birth weight was 2,360 grams, body length 48 cm, head circumference 30 cm, chest circumference 29 cm, and abdominal circumference 28 cm. Delivery was assisted by a physician in a hospital setting. The newborn cried immediately, exhibited strong muscle tone and activity, and had clear amniotic fluid. The APGAR scores were 8 at one minute and 9 at five minutes. He received vitamin K within the first hour of life and was given hepatitis B (HBO) immunization within two hours.

In the initial postpartum days, breastfeeding was suboptimal. The mother's milk supply was insufficient, and the newborn's sucking reflex was weak, resulting in infrequent and prolonged breastfeeding sessions. This likely contributed to inadequate fluid intake and elevated bilirubin levels. On the second day of life, the infant exhibited jaundice, classified as Kramer stage I, with a total bilirubin level of 10.8 mg/dL. The jaundice began to subside by the fourth day of life.

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The infant received continuous postnatal care, including counseling on early and exclusive breastfeeding, adequate hydration, and nutrition to prevent severe hyperbilirubinemia, recognition of neonatal danger signs, personal hygiene, thermal regulation, and the importance of exclusive breastfeeding for the first six months.

On the sixth day of life, the infant was brought to the community health center for a routine neonatal visit. The physical assessment revealed Kramer stage IV jaundice. Following consultation with the attending physician, the infant was referred to the hospital for further evaluation and treatment. A bilirubin test revealed a total serum bilirubin level of 24 mg/dL, warranting hospitalization and phototherapy. During the five-day hospital stay, the infant's fluid status and bilirubin levels were closely monitored. On the second day of treatment, the bilirubin level decreased to 20 mg/dL, and by the fourth day, it had further declined to 16 mg/dL. The infant was discharged in stable condition with continued follow-up recommended.

Throughout the infant's hospitalization and up to the point of discharge, the baby and parents received ongoing support through telehealth services. These included regular reminders about the importance of breastfeeding and maintaining an adequate supply of breast milk. Parents were counselled on how to express breast milk, the importance of providing adequate fluids and nutrition—specifically exclusive breastfeeding on demand without the use of formula—, personal hygiene, thermoregulation (keeping the baby warm), and general newborn care. This support was provided through a combination of telehealth and scheduled home visits.

The primary goal of this parental support was to empower both parents to make informed decisions about their child's health and well-being. Excessive fear or anxiety surrounding neonatal hyperbilirubinemia can result in harmful consequences, such as maternal distress, reduced frequency or effectiveness of breastfeeding, unnecessary interventions, and increased financial burden.

Considering the baby's jaundice history—initially identified on the second day and recurring with greater severity on the sixth day—and the clinical background of labour induction

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due to maternal preeclampsia, referral to a health facility was deemed essential. This referral ensured timely diagnosis and management, as other contributing factors, such as low birth weight, may exacerbate the severity of jaundice. The prognosis in this case was considered guarded to poor, given the recurrence of jaundice at day six accompanied by a bilirubin level exceeding standard reference value.

While parents—primarily the mother and father—held decision-making authority regarding the baby's care, input from extended family members was also considered. In this case, both parents agreed to delegate carefully to the hospital team until the infant was declared stable and discharged in good health.

A multidisciplinary approach was employed to provide comprehensive care and formulate an optimal clinical management plan for neonatal jaundice. The multidisciplinary team collaborated to minimize the risk of complications and ensure the infant's safe recovery. A continuity-of-care framework was essential to facilitate ongoing support for both the newborn and the family during hospitalization and after discharge.

Additionally, maternal care was a critical part of the management strategy. The mother's history of preeclampsia and prolonged labour induction likely contributed to the newborn's hyperbilirubinemia. The use of oxytocin for labour induction in the context of preeclampsia may increase the risk of neonatal jaundice due to prolonged labour , delayed cervical dilation, and compromised placental function, all of which can impair neonatal bilirubin metabolism. Furthermore, inadequate breast milk intake in the early neonatal period can aggravate the condition by reducing bilirubin excretion.

To mitigate these risks, close monitoring during induced labour and early initiation and optimization of breastfeeding are critical components of newborn care. These practices are essential preventive measures for neonatal hyperbilirubinemia.

In terms of future reproductive health planning, the mother chose a long-acting reversible contraceptive (LARC)—specifically, an intrauterine device (IUD)—to promote healthy birth spacing and reduce the risk of recurrent pregnancy complications. Her contraceptive decision was influenced by a prior negative experience with oral

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contraceptive pills, which caused persistent headaches, and a desire to avoid injectable contraceptives due to concerns about menstrual irregularities and other side effects. The IUD was selected as a suitable, hormone-free alternative that supports long-term maternal health and family planning goals.

## DISCUSSION

Pregnancy complications such as preeclampsia are recognized as one of the most common causes of hyperbilirubinemia in newborns. Neonatal hyperbilirubinemia associated with maternal preeclampsia is often linked to coagulation disorders that interfere with bilirubin metabolism (Belay *et al.*, 2023). This association is supported by Mosayebi *et al.*, (2016), who reported a prevalence of 39.2% of hyperbilirubinemia among neonates born to mothers with preeclampsia. Similarly, Boskabadi, Rakhshanizadeh, and Zakerihamidi (2020) identified preeclampsia as one of the most frequent maternal risk factors for neonatal hyperbilirubinemia. Belay *et al.*, (2023) further confirmed a statistically significant relationship between this maternal complication and the occurrence of hyperbilirubinemia in neonates.

In addition to maternal health conditions, certain delivery-related factors—such as vacuum-assisted vaginal delivery, cephalohematoma, and labour induction with oxytocin—have long been considered risk factors for neonatal jaundice. This theory was proposed by Cheo and Karen nearly 25 years ago, suggesting that oxytocin may directly affect bilirubin metabolism.

Oxytocin induction has become an essential component of labour management, particularly in cases involving preeclampsia. However, recent studies suggest that its use may be associated with an increased incidence of neonatal hyperbilirubinemia (Abdelgader *et al.*, 2022; Akhavan *et al.*, 2016; Seyedi, Mirghafourvand, and Tabrizi, 2017).

The relationship between oxytocin induction and neonatal jaundice has been a topic of debate for decades. A 1978 study first identified a potential link between oxytocin use and increased bilirubin levels in newborns. However, this finding was challenged in 1979 when subsequent research reported no significant association. Despite this early controversy, numerous more

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recent studies have reaffirmed the connection, demonstrating that oxytocin used for labour induction may indeed increase the risk of hyperbilirubinemia.

In contrast, pregnancy complications such as preeclampsia are now considered established and persistent risk factors for neonatal hyperbilirubinemia. In the present case, oxytocin induction for labour management in a mother with preeclampsia is believed to have contributed to the development of hyperbilirubinemia in the newborn. This conclusion is consistent with findings by Abdelgader *et al.*, (2022), Akhavan *et al.*, (2016), and Seyedi *et al.*, (2017), all of whom reported a significant correlation between oxytocin induction and neonatal jaundice.

Elevated levels of hyperbilirubinemia in neonates following oxytocin-induced labour have been associated with hemolysis. Oxytocin's hypoosmotic properties are thought to cause water retention within neonatal red blood cells, impairing their deformability (Garosi, Mohammadi, and Ranjkesh, 2016). This reduction in red blood cell flexibility is attributed to osmotic swelling, as oxytocin influences the red blood cell membrane and promotes excessive water influx. Other mechanisms contributing to this phenomenon include mechanical trauma to fetal erythrocytes during uterine contractions, which increases cell lysis as red blood cells pass through constricted blood vessels. Additionally, oxytocin's vasoconstrictive effect on uterine circulation and its interaction with antidiuretic hormone pathways may further impair red blood cell integrity (Akhavan *et al.*, 2016).

Moreover, the surge in cortisol typically seen in late pregnancy plays a crucial role in fetal organ maturation, including the development of hepatic enzymes responsible for bilirubin metabolism. The production and activation of these liver enzymes—vital for the excretion of bilirubin—are corticosteroid-dependent. Consequently, oxytocin use during labour may be associated with neonatal jaundice by interfering with this maturational process, particularly in cases of preterm or physiologically immature livers (Mani *et al.*, 2020).

The diagnosis of neonatal hyperbilirubinemia during the second postnatal visit was supported by clinical findings and a comprehensive history, which included family history of

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jaundice, anemia, splenectomy, spherocytosis, glucose-6-phosphate dehydrogenase (G6PD) deficiency, neonatal jaundice or anemia in siblings, maternal illness or medication use during pregnancy, traumatic delivery, total parenteral nutrition, and breastfeeding practices (Ministry of Health of the Republic of Indonesia, 2019).

Clinically, jaundice is detected by observing the skin for yellow discoloration after gentle pressure with a finger, beginning at the head and progressing in a cephalocaudal pattern. The examination should be performed under natural sunlight or in a well-lit environment to enhance accuracy.

Prompt management of hyperbilirubinemia is critical to prevent the development of acute bilirubin encephalopathy (ABE) and its progression to irreversible kernicterus. However, adherence to the American Academy of Paediatrics (AAP) guidelines remains suboptimal in many neonatal units across Indonesia. In addition to phototherapy, the early initiation and maintenance of exclusive breastfeeding are essential. Breast milk has been shown to support bilirubin clearance and reduce the duration and intensity of phototherapy (Sánchez *et al.*, 2017).

The AAP recommends continued breastfeeding at a frequency of 8–10 times within 24 hours and advises against replacing breast milk with water, sugar water, or formula. Such substitutions have not been proven effective in lowering bilirubin levels in healthy term infants and may impair immunoglobulin function in breast milk and increase the risk of intestinal injury. Thus, on-demand and exclusive breastfeeding remain the optimal nutritional strategies for infants with a history of jaundice.

Management of Neonatal Hyperbilirubinemia (Kramer IV) on Day 6 Postpartum.

Neonatal hyperbilirubinemia or jaundice classified as Kramer IV on the sixth day of life requires immediate referral as it is considered a form of pathological jaundice. Prompt referral is necessary to evaluate bilirubin levels, conduct a complete blood count (if indicated), and initiate appropriate treatment, most commonly phototherapy. According to Pace, Brown, and DeGeorge (2019), the first-line treatment for neonatal hyperbilirubinemia is phototherapy.

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In this case, phototherapy was administered. Based on guidelines from the American Academy of Pediatrics (AAP), phototherapy is indicated for healthy neonates older than 72 hours with total serum bilirubin (TSB) between 20–25 mg/dL and a birth weight of 2000–2500 grams. During phototherapy, the infant is placed under a special blue-green light, which helps convert unconjugated bilirubin into lumirubin, a water-soluble form that can be excreted through urine and feces. During treatment, the infant wears only a diaper and protective eye coverings to maximize skin exposure and minimize risk. Accurate diagnosis and timely intervention are critical to prevent complications and support optimal neurodevelopmental outcomes (Queensland Clinical Guidelines, 2022).

Management of hyperbilirubinemia in Indonesia follows the National Hyperbilirubinemia Guidelines issued by the Ministry of Health (2019). However, many neonatal units still initiate phototherapy for full-term newborns with TSB >12 mg/dL and preterm newborns with TSB >10 mg/dL, regardless of gestational age and body weight. This practice suggests a need for greater adherence to AAP-based thresholds, which are more specific and evidence-based.

Although phototherapy is considered safe, both short-term and long-term side effects have been reported. Short-term effects include increased bowel activity, diarrhea, and temperature instability, while long-term risks may include childhood asthma and type 1 diabetes. Additionally, phototherapy may cause emotional stress for parents due to frequent blood sampling, physical separation from the infant, and potential disruption of breastfeeding (Pace, Brown, and DeGeorge, 2019).

Given the history of pregnancy complications and oxytocin-induced labour , which led to the development of neonatal jaundice, continuity of care is essential. This includes supporting exclusive breastfeeding, ensuring appropriate follow-up care, and preventing recurrence of complications in future pregnancies.

In this case, exclusive breastfeeding was maintained from birth until the baby was hospitalized. During hospitalization, the infant received expressed breast milk every two days, and the mother breastfed directly once per day. The use of formula was

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avoided to support successful breastfeeding. Direct breastfeeding is proven to accelerate neonatal recovery and reduce the intensity of phototherapy (Sánchez *et al.*, 2017).

After discharge, exclusive breastfeeding continued at home. Post-treatment care included exposure to morning sunlight, a practice with varying expert opinions. Some researchers argue that sunlight exposure has no clinical benefit, while others claim it may help reduce bilirubin levels. According to the Indonesian Pediatric Society (IDAI, 2013), exposure to sunlight can stimulate thirst and fluid intake, which in turn promotes bile excretion into the intestines. Direct (conjugated) bilirubin is then broken down into stercobilin and urobilinogen, which are excreted through feces and urine.

Special attention must be given to maternal emotional well-being, especially in the immediate postpartum period, to prevent maternal stress and postpartum blues. Providing emotional support and education is essential in ensuring both the mother's and baby's recovery.

Additional interventions in this case included postpartum support and contraceptive counseling. The mother opted for a long-acting reversible contraceptive (LARC), specifically an intrauterine device (IUD), to help space future pregnancies and reduce the likelihood of repeated complications. This decision was based on the mother's previous experiences with oral contraceptives, which caused persistent headaches, and a preference to avoid injectable contraceptives due to side effects such as menstrual irregularities.

## CONCLUSIONS

Hyperbilirubinemia, commonly known as neonatal jaundice, remains one of the most frequent conditions observed in otherwise healthy newborns during the first week of life. Its underlying causes are often multifactorial, complex, and interconnected, and some—such as the association between oxytocin induction and neonatal jaundice—remain the subject of ongoing debate and clinical inquiry.

Effective management must be guided by the latest clinical guidelines, with a strong emphasis on continuity of care to ensure the newborn's well-being. This includes timely diagnosis, appropriate interventions like

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phototherapy, and ongoing support for exclusive breastfeeding and parental education.

The decision to induce labour with oxytocin, particularly in the context of maternal complications such as preeclampsia, must be made with careful consideration. While oxytocin plays a crucial role in facilitating labour , it also carries potential risks—one of which is the increased likelihood of neonatal hyperbilirubinemia. Therefore, healthcare providers must carefully weigh the benefits of intervention against the risk of adverse neonatal outcomes.

Ultimately, the goal of managing hyperbilirubinemia is not only to reduce the risk of complications such as acute bilirubin encephalopathy and kernicterus, but also to promote optimal development and quality of life for the newborn. Holistic, family-centered care—both in the hospital and at home—is essential in achieving these outcomes.

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