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Association of Oxytocin-Augmented Labor with Neonatal Jaundice Requiring Phototherapy: A Comparative Study

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ABSTRACT

Neonatal jaundice is a dangerous illness that, if left untreated, can lead to deadly consequences. Oxytocin seems to have a dose-dependent influence on elevated plasma bilirubin levels in cord blood, which are likely exacerbated by the breakdown of fetal red blood cells. **Objectives:** To determine the frequency of patients who undergo labour augmentation with the use of oxytocin and to compare the frequency of neonatal jaundice among the gravid female who labor with and without oxytocin augmentation. **Methods:** This analytical cohort study was conducted in the Department of Obstetrics and Gynaecology, Sughra Shafi Medical Complex, Narowal from 01-07-2021 to 31-12-2021. A total of 186 gravid females were included in this study. These patients were divided into two groups: Group A (augmentation with oxytocin, n=30) and Group B (spontaneous labour without oxytocin augmentation, n=156). Neonatal jaundice was assessed based on serum bilirubin levels and whether phototherapy was required. Data were analyzed using SPSS-25, with descriptive statistics and relevant comparisons between the groups. **Results:** The mean age of the participants was 26.9 ± 4.3 years. There were 56 primigravida (30.1%) and 130 multigravidas (69.9%). Neonatal jaundice requiring phototherapy occurred in 40% of neonates in Group A and in 19.2% in Group B. **Conclusions:** It was concluded that when maternal oxytocin is used to induce labor, newborn jaundice is more likely to occur and phototherapy is more frequently required. It is advisable to consider careful oxytocin dosing to avoid the risk of hyperbilirubinemia.

INTRODUCTION

Numerous factors have influenced the experience of childbirth, including medical interventions, the degree of labor pain, the quality of care and services, and awareness of the labor process. One of the most common complications observed in both term and preterm neonates is neonatal jaundice. Among the possible contributors to the increasing prevalence of neonatal jaundice is the use of oxytocin in labor management [1, 2]. Strong and synchronized uterine contractions are essential for cervical dilation and fetal delivery during parturition. However, the first stage of labor can sometimes be prolonged; evidence suggests that approximately 14% of women entering labor for the first time experience a delay or arrest in cervical dilation. In such cases, after amniotomy (artificial rupture of membranes), labor augmentation achieved by increasing the frequency and intensity of contractions is often performed using intravenous oxytocin [3]. Although oxytocin is widely utilized for labor induction and augmentation, it may lead to adverse outcomes such as uterine hyper stimulation and

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fetal distress. Prostaglandins are also commonly administered systemically or locally to ripen the cervix and induce or augment labor. Oxytocin, a naturally occurring peptide hormone, facilitates uterine and epididymal muscle contraction and is involved in milk ejection during lactation [4]. Several studies have confirmed the association between oxytocin administration and the development of neonatal jaundice. Findings suggest that oxytocin's vasopressin-like effects induce osmotic swelling in erythrocytes, making them more fragile and susceptible to hemolysis, ultimately leading to hyperbilirubinemia in neonates [5]. Erythrocyte deformability plays a critical role in cell survival, and a reduction in deformability has been associated with increased hemolysis in various contexts [6]. According to studies neonatal jaundice requiring phototherapy was more frequently observed (38%) among neonates born to mothers who underwent labor augmentation either with or without oxytocin during term spontaneous vaginal delivery. To the best of the candidate's knowledge, limited published data, both locally and internationally, are available on this specific association [7, 8]. This study is, therefore, significant in evaluating whether oxytocin, a drug frequently employed to augment labor increases the incidence of neonatal jaundice. If this relationship is confirmed in the local population, the identification of alternative therapeutic options could help in preventing this potentially serious neonatal complication, ultimately reducing associated neonatal morbidity and mortality [9]. In addition to its use in promoting labor progression, oxytocin is also routinely administered intramuscularly during the third stage of labor to prevent postpartum hemorrhage. According to the Listening to Mothers II study, approximately 50% of women giving birth in U.S. hospitals received oxytocin for labor induction or augmentation [10]. Oxytocin exerts its effects by binding to G-protein-coupled oxytocin receptors (OTRs) located on myoepithelial cells, resulting in increased intracellular calcium levels and smooth muscle contraction [11]. Given the widespread use of oxytocin in obstetric care and the growing concern over its potential side effects, it is crucial to further investigate its relationship with neonatal outcomes, particularly jaundice. If a significant association is confirmed between oxytocin use and increased rates of neonatal jaundice requiring phototherapy, this may have important clinical implications for labor management practices. Such findings could support the consideration of alternative methods or modified dosing protocols to reduce the risk of hyperbilirubinemia and its complications in neonates.

This study aims to determine the frequency of labor augmentation with oxytocin and to compare the frequency of neonatal jaundice among gravid females who undergo labor with and without oxytocin augmentation in a local population setting.

METHODS

This analytical cohort study was conducted at the Department of Obstetrics and Gynaecology, Sughra Shafi Medical Complex, Narowal, from 01-07-2021 to 31-12-2021, after obtaining ethical approval from Green International University (IRC-GIU-158-12-2024). Gravid female aged between 18 and 35 years, carrying a single live fetus in cephalic presentation and undergoing labor as per operational definition, were included in the study after signing written informed consent. Patients were excluded if they were primary gravida with a history of uterine surgery such as myomectomy, or if they had Rh incompatibility, neonates with WBC count >15000/mm^3, birth weight <2500 grams, gross congenital anomalies, or APGAR score <7 at five minutes. Mothers with comorbid conditions such as diabetes mellitus (random blood sugar >200 mg/dL) or hypertension (systolic blood pressure >140 mmHg on two separate occasions, 12 hours apart) were also excluded, based on clinical history, examination, and investigations. After approval, a total of 186 gravid females fulfilling the criteria and presenting to the Obstetrics Department were counselled, explained the study objectives, and enrolled after written consent. A detailed history was taken, and patients were clinically assessed and divided into two groups based on labor progression and need for augmentation. Group A consisted of those requiring augmentation with oxytocin, and Group B included those undergoing spontaneous labor without oxytocin. After the active stage of labor was established on clinical examination, patients were monitored in the labor room using cardiotocography (CTG), and labor progression was checked every 30 minutes. Labor arrest was defined as per operational criteria, and patients requiring augmentation were assigned to Group A. Oxytocin was administered at 6-8 drops per minute in 500 ml of normal saline, starting at 5 mIU/min and increased by 6 mIU/min every 30 minutes until effective uterine contractions were achieved or the baby was delivered. In Group B, labor was allowed to progress spontaneously with continuous CTG monitoring until delivery. After birth, neonates were handed over to the Pediatrics Department and monitored for hyperbilirubinemia requiring phototherapy for three days, as per operational definition. To minimize bias, all deliveries were conducted by the same obstetrics team, including the candidate, and all lab tests were performed in the hospital's laboratory to maintain uniformity. Neonatal jaundice was defined as serum bilirubin >15 mg/dL requiring phototherapy within the first three days of life. Data were entered and analyzed using SPSS version 25.0. Numerical variables such as maternal age, BMI, and

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neonatal birth weight were presented as mean ± standard deviation. Categorical variables like oxytocin use and neonatal jaundice requiring phototherapy were presented as frequencies and percentages. The chi-square test was applied to compare the frequency of neonatal jaundice requiring phototherapy between the two groups, considering a p-value ≤0.05 as statistically significant. Parity was also recorded as frequency. Data were stratified for age, parity, BMI, and neonatal weight, and a post-stratification chi-square test was applied again, with a p-value ≤0.05 considered statistically significant.

RESULTS

Results present a summary of the demographic, clinical, and outcome characteristics of the total study population (n=186). The majority of participants were aged between 26 and 35 years, comprising 62.9% of the sample, with a mean age of 26.9 ± 4.3 years. Regarding parity, 30.1% of the women were primigravida, while 69.9% were multigravida, indicating a higher representation of women with previous deliveries. In terms of body mass index (BMI), 59.7% of the participants had a BMI below 30 kg/m^2, whereas 40.3% had a BMI of 30 kg/m^2 or above. The mean BMI was calculated to be 29.8 ± 5.0 kg/m^2. Neonatal weight distribution showed that 87.1% of the newborns weighed more than 2.5 kg, and the mean birth weight was 3.2 ± 0.5 kg. The distribution of labor augmentation methods showed that 16.1% of the participants received oxytocin for augmentation (Group A), while 83.9% underwent spontaneous or non-augmented labor (Group B). Among those in Group A, 40.0% of the neonates developed jaundice that required phototherapy, compared to 19.2% in Group B. This difference was statistically significant (p = 0.013), indicating a potential association between oxytocin use during labor and the increased risk of neonatal hyperbilirubinemia necessitating phototherapy (Table 1).

Table 1: Demographic, Clinical, and Outcome Characteristics of the Study Population (n=186)

Variables	Category	n (%)	Mean ± SD
Age	18-25	69 (37.1%)	26.9 ± 4.3
	26-35	117 (62.9%)	
Parity	Primigravida	56 (30.1%)	–
	Multigravida	130 (69.9%)	
BMI (kg/m2)	<30	111 (59.7%)	29.8 ± 5.0
	>30	75 (40.3%)	
Neonatal Weight (kg)	<2.5	24 (12.9%)	3.2 ± 0.5
	>2.5	162 (87.1%)	
Augmented Labour	Augmentation with Oxytocin	30 (16.1%)	–
	Augmentation without Oxytocin	156 (83.9%)	

Findings show that neonatal jaundice requiring phototherapy occurred significantly more often in newborns delivered with oxytocin-augmented labor (40%) compared to those without oxytocin (19.2%). This difference was statistically significant (p=0.013), suggesting a potential link between oxytocin use and increased risk of jaundice (Table 2).

Table 2: Comparison of labor with and without Oxytocin Augmentation

Neonatal Jaundice Requiring Phototherapy	LABOUR		Total	p-Value
	Group A with Oxytocin Augmentation	Group B without Oxytocin Augmentation		
Yes	12 (40%)	30 (19.2%)	42 (22.6%)	0.013
No	18 (60%)	126 (80.8%)	144 (77.4%)	
Total	30	156	186	

Note. Neonatal jaundice was significantly more frequent in oxytocin-augmented labor (p=0.013).

The study illustrates that neonatal jaundice requiring phototherapy was significantly more common in the oxytocin group among mothers aged 26–35, multigravida women, and neonates weighing over 2.5 kg. No significant differences were observed for younger mothers (18–25 years), primigravida women, low birth weight neonates, or BMI categories. These findings suggest that specific maternal and neonatal factors may influence the risk of jaundice when labor is augmented with oxytocin (Table 3).

Table 3: Stratification of Neonatal Jaundice Requiring Phototherapy by Maternal and Neonatal Characteristics (n = 186)

Variables	Category	Neonatal Jaundice	Group A	Group B	Total	p-Value
Age	18-25	Yes	2 (15.4%)	11 (84.6%)	13 (100%)	0.781
		No	7 (12.5%)	49 (87.5%)	56 (100%)	
	26-35	Yes	10 (34.5%)	19 (65.5%)	29 (100%)	0.007
		No	11 (12.5%)	77 (87.5%)	88 (100%)	
Parity	Primi-gravida	Yes	4 (36.4%)	7 (63.6%)	11 (100%)	0.119
		No	7 (15.6%)	38 (84.4%)	45 (100%)	
	Multi-gravida	Yes	8 (25.8%)	23 (74.2%)	31 (100%)	0.043
		No	11 (11.2%)	88 (88.9%)	99 (100%)	
Neonatal Weight	≤2.5	Yes	1 (9.1%)	10 (90.9%)	11 (100%)	0.902
		No	1 (7.7%)	12 (92.3%)	13 (100%)	
	>2.5	Yes	11 (35.5%)	20 (64.5%)	31 (100%)	0.003
		No	17 (13%)	114 (87%)	131 (100%)	
BMI	<30	Yes	4 (14.8%)	23 (85.2%)	27 (100%)	0.692
		No	10 (11.9%)	74 (88.1%)	84 (100%)	

Note. A p-value <0.05 indicates a statistically significant association between oxytocin use and neonatal jaundice within specific subgroups.

DISCUSSION

Both term and preterm babies may be affected by hyperbilirubinemia, a benign illness that often affects newborns [12]. The extensive use of oxytocic medications to treat labor may be one of the causes of the higher frequency of neonatal hyperbilirubinemia (NNH) in healthy-term newborns. It is widely known that maternal oxytocin

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usage is linked to NNH [6]. In contrast to spontaneous labor, oxytocin-induced labor results in less deformable fetal erythrocytes. According to in vitro research, oxytocin treatment reduced erythrocyte deformability in a time- and dose-related manner [12]. Despite recent improvements in the treatment of newborns with jaundice, bilirubin poisoning is still a major issue. Although rare, kernicterus accounts for at least 70% of long-term morbidities and 10% of deaths in these neonates [13]. Deformability was impacted by oxytocin crossing the placenta, as demonstrated by in vitro studies. The range of oxytocin concentrations in maternal blood during oxytocin-induced labor revealed both a time-related and a dose-related effect of oxytocin on erythrocyte deformability [14]. The clinical observations that NNH during labor induction is correlated with the dosage and duration of oxytocin administration are similarly explained by these in vitro findings. Our research confirmed that oxytocin-induced labor was associated with an increase in erythrocyte breakdown. Oxytocin's vasopressin-like activity triggers the passage of water and electrolytes across the erythrocyte membrane, resulting in osmotic swelling. This is a known factor that reduces erythrocyte deformability and speeds up erythrocyte breakdown. Clinical hyperbilirubinemia develops in the newborn because their hepatic enzymes cannot handle the increased bilirubin production. Since oxytocin is a crucial obstetrical medication and its usage is most likely unavoidable, it is also impossible to halt its effects on erythrocytes. Nonetheless, it makes sense to lower the oxytocin dosage to avoid hyperbilirubinemia [16]. In the current study, 16.1% of the patients underwent augmentation with oxytocin, and 83.9% of patients did not receive oxytocin. Our results are comparable with a study carried out by Kellie, who demonstrated that 14% of women underwent augmentation with oxytocin [17]. In the group with oxytocin augmentation, the frequency of neonatal jaundice requiring phototherapy was 40%, while in the group without oxytocin augmentation, 19.2% of neonates required phototherapy [18]. The difference between the two groups was statistically significant (p=0.013). The findings of our study are consistent with a study conducted by Balasubramanian *et al.*, [19], who reported that neonatal jaundice requiring phototherapy occurred in 38% of neonates whose mothers received oxytocin, compared to 18% in the group without oxytocin augmentation [20].

CONCLUSIONS

It was concluded that inducing labor with maternal oxytocin raises the risk of newborn jaundice requiring phototherapy; therefore, it makes sense to lower the oxytocin dosage to avoid hyperbilirubinemia.

Authors Contribution

Conceptualization: NAB, FS
Methodology: NAB, FS, SW, SA
Formal analysis: NAB, SW
Writing review and editing: NAB, FS, SW, SA, ZA, AI

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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REFERENCES

[1] Makvandi S, Mirzaiinajmabadi K, Tehranian N, Esmily H, Mirteimoori M. The effect of normal physiologic childbirth on labor pain relief: An interventional study in mother-friendly hospitals. Maedica. 2018 Dec; 13(4): 286.

[2] Aziato L, Acheampong AK, Umoar KL. Labour pain experiences and perceptions: a qualitative study among post-partum women in Ghana. BioMed Central Pregnancy and Childbirth. 2017 Dec; 17: 1-9. doi: 10.1186/s12884-017-1248-1.

[3] Kendrick KM. Oxytocin, motherhood and bonding. Experimental physiology. 2000 Mar; 85(s1): 111s-24s. doi: 10.1111/j.1469-445X.2000.tb00014.x.

[4] Ito E, Shima R, Yoshioka T. A novel role of oxytocin: Oxytocin-induced well-being in humans. Biophysics and Physicobiology. 2019; 16: 132-9. doi: 10.2142/biophysico.16.0_132.

[5] Fuchs AR, Romero R, Keefe D, Parra M, Oyarzun E, Behnke E. Oxytocin secretion and human parturition: pulse frequency and duration increase during spontaneous labor in women. American Journal of Obstetrics and Gynaecology. 1991 1;165(4): 1515-23. doi: 10.1016/S0002-9378(12)90793-0.

[6] Hermesch AC, Kernberg AS, Layoun VR, Caughey AB. Oxytocin: Physiology, Pharmacology, And Clinical Application for Labor Management. American Journal of Obstetrics and Gynecology. 2024 Mar; 230(3): S729-39. doi: 10.1016/j.ajog.2023.06.041.

[7] Abdelgader A, Mustafa H, Tayib R, Saed W. Association Between Neonatal Jaundice and Maternal Oxytocin Infusion in Albayda Medical Center. Al Qalam Journal of Medical and Applied Sciences. 2022 Dec: 602-5.

[8] Shukla J, Buch S, Chandrayan P. Effect of Oxytocin Augmentation on Neonatal Bilirubin Levels: A Case Control Study. Indian Journal of Forensic Medicine and Toxicology. 2022 Apr; 16(2): 101-4. doi: 10.37506/ijfmt.v16i2.17928.

DOI: https://doi.org/10.54393/pjhs.v6i6.3004

[9] Jonas W, Johansson LM, Nissen E, Ejdebäck M, Ransjö-Arvidson AB, *et al.* Effects of intrapartum oxytocin administration and epidural analgesia on the concentration of plasma oxytocin and prolactin, in response to suckling during the second day postpartum. Breastfeeding Medicine. 2009 Jun; 4(2): 71-82. doi: 10.1089/bfm.2008.0002.

[10] Declercq ER, Sakala C, Corry MP, Applebaum S. Listening to mothers II: report of the second national US survey of women's childbearing experiences: conducted January–February 2006 for Childbirth Connection by Harris Interactive® in partnership with Lamaze International. The Journal of Perinatal Education. 2007; 16(4): 15. doi: 10.1624/105812407X244778.

[11] Liu XY, Ling S, Liu Y, Jia S, Wang X, Li T *et al.* Dual oxytocin receptor-G protein signaling in the autoregulation of activities of oxytocin neurons. Neuroendocrinology. 2024 Feb; 114(2): 134-57. doi: 10.1159/000534490.

[12] Waldemar AC and Ambalavanan N. Jaundice and hyperbilirubinemia in the newborn. Nelson Textbook of Pediatrics. 2011.

[13] Ip S, Chung M, Kulig J, O'Brien R, Sege R. Subcommittee on Hyperbilirubinemia. An evidence-based review of important issues concerning neonatal hyperbilirubinemia. Pediatrics. 2004 Jul; 114(1): e130-53. doi: 10.1542/peds.114.1.e130.

[14] Abbas SS, James J, Sreedevi N. Oxytocin and neonatal hyperbilirubinemia: A prospective cohort study. Indian Journal of Child Health. 2015 Sep; 2(3): 129-30. doi: 10.32677/IJCH.2015.v02.i03.008.

[15] Abdelrahman M. The Effects of Antibiotic-Oxytocin Interactions on Social and Motivational Behavior (Doctoral dissertation, University Honors College, Middle Tennessee State University). 2024.

[16] Abodollahi S, Ghesmat SP, Rad MK, Behrouzi K. The Impact of Labor Oxytocin Use on Newborn Liver Enzymes. Journal of Family and Reproductive Health. 2024 Sep; 18(3): 160. doi: 10.18502/jfrh.v18i3.16657.

[17] Kellie FJ. Continuous versus pulsatile oxytocin administration for the augmentation of labour. The Cochrane Database of Systematic Reviews. 2017 Aug; 2017(8): CD011632. doi: 10.1002/14651858.CD011632.pub2.

[18] Selin L, Wennerholm UB, Jonsson M, Dencker A, Wallin G, *et al.* High-dose versus low-dose of oxytocin for labour augmentation: a randomised controlled trial. Women and Birth. 2019 Aug; 32(4): 356-63. doi: 10.1016/j.wombi.2018.09.002.

[19] Balasubramanian T, Monika R, Ramsheed M, Rafih M, Salman Met *et al.* Evaluation of etiology and treatment of jaundice in neonates pursuit phototherapy in a tertiary care referral hospital prospective cohort study. Annals of the Romanian Society for Cell Biology. 2021; 25(4): 9337-48.

[20] Mani M, Chevuturi RP, Banerjee GB, Ghosh S, Hossain T, Sahu S. Neonatal Hyperbilirubinemia Associated with Oxytocin Labour Augmentation. Journal of Dental and Medical Sciences. 2020; 19(3): 01-6.