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Effects of oxytocin induction on early postpartum hemorrhage, perineal integrity, and breastfeeding: a case–control study

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SUMMARY

OBJECTIVE: The aim of this study was to evaluate the postpartum hemorrhage, perineal integrity, and breastfeeding results of mothers who underwent oxytocin induction in the first stage of labor in the early postpartum period.

METHODS: This single-center observational case–control study was conducted in the obstetric unit of a public hospital in Istanbul. The study sampling included 44 pregnant women who received oxytocin induction (case group) and 44 pregnant women who did not receive oxytocin (control group). The Personal Information Form, LATCH Breastfeeding Assessment Tool, Breastfeeding Self-Efficacy Scale, Redness, Edema, Ecchymosis, Discharge, and Approximation Scale, and Postpartum Hemorrhage Collection Bag were used in data collection, and pad follow-up was carried out.

RESULTS: The amount of hemorrhage in the first 24 h of the postpartum period and the mean Redness, Edema, Ecchymosis, Discharge, and Approximation Scale score were significantly higher in the case group. While 47.7% of the oxytocin-induced women had 1st or 2nd, and 11.4% had 3rd or 4th degrees of lacerations, 20.5% of the control group had 1st or 2nd, and 2.3% had 3rd or 4th degrees of lacerations. There was no significant difference between the mean scores of the Breastfeeding Self-Efficacy Scale and LATCH Breastfeeding Assessment Tool in both groups.

CONCLUSION: According to the study findings, it was determined that oxytocin induction administered in the first stage of labor increased hemorrhage and perineal trauma in the early postpartum period but did not affect the results of breastfeeding.

Clinical Trial Registration Number: NCT04441125.

KEYWORDS: Breastfeeding. Oxytocin. Lacerations. Postpartum hemorrhage.

INTRODUCTION

Synthetic oxytocin (SynOT) is an essential component of the active management of labor. However, universal evidence-based standards regarding oxytocin dose and patient response are insufficient, and the decision to administer SynOT is mainly subjective[1]. Routine infusion of administered SynOT without evidence is of particular concern in terms of the risk of postpartum hemorrhage (PPH)[2]. Clinical studies of the effect of oxytocin administration during labor on the risk of PPH have reported conflicting results[3]. Khireddine et al. reported that labor oxytocin induction in low-risk women was associated with a higher risk of PPH than spontaneous vaginal delivery[4].

It has been reported that breastfeeding difficulties may be experienced in neonates due to exposure of the developing fetal brain, the protective blood–brain barrier of which is not yet mature, to high amounts of oxytocin[5]. Gomes et al. reported in their study that there is an association between intrapartum oxytocin dose and an increased risk of early cessation of breastfeeding among infants[6].

Perineal trauma is an essential complication in women after childbirth. In the literature, different study results show the effect of oxytocin administration on the perineum[7-9]. Similarly, in a study by Nakai et al. among Japanese women, severe perineal damage was found in 1.7% of 7,946 deliveries, and oxytocin induction was determined to be an essential risk factor, among other risk factors[10].

The almost routine use of oxytocin induction during labor in primigravid women in our country increases the importance of this issue. Determining how breastfeeding, which has an essential role in protecting and improving public health, PPH, the primary cause of maternal mortality, and perineal integrity are affected by oxytocin induction will provide essential data for health professionals and give an idea about the gaps in practice and research.

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The research conforms to the provisions of the Declaration of Helsinki (as revised in Brazil in 2013). All participants gave informed consent for the research, and their anonymity was preserved.

METHODS

This observational case–control study was conducted in the obstetric unit of a public hospital between September 2019 and December 2020.

The sample size was calculated using the volume of postpartum blood loss reported in the study by Mansy[5]. The minimum sample size was calculated at 80% power, a 5% significance level, and an expected effect size of 0.53 (Cohen's d), and it was found to be 44 in each group and 88 in total. The sample size was determined to be 44 patients for comparison of means between the two groups.

The inclusion criteria for pregnant women included primigravid pregnant women between the ages of 18 and 35 years, literate, with a hemoglobin of 10 g/dL and above, without mental or psychological problems or chronic diseases, and between 38 and 42 weeks of gestation. For newborns, those who had an Apgar score ≥7 at the first and fifth minutes, had no contraindications for breastfeeding, had no congenital anomalies, and had birth weight between 2500 g and 4000 g. Multiple pregnancies, a history of perineal surgery, and cases with breastfeeding problems related to the mother or the infant were excluded from the study.

Depending on the clinical decision to stimulate or increase the labor process, those who received an oxytocin infusion were defined as the case group. A total of 44 cases were randomly selected using computer-assisted randomization among the patients whose induction decision was made by the obstetrician working in the clinic (https://www.randomizer.org/#randomize). Pregnant women who did not receive an oxytocin infusion and were followed spontaneously formed the control group, and 44 pregnant women were randomly selected from this group using computer-assisted randomization.

Data collection tools

The Personal Information Form, the LATCH Breastfeeding Assessment Tool, Breastfeeding Self-Efficacy Scale (BSES), and PPH collection bag were used in data collection, and sanitary pad follow-up was carried out.

LATCH Breastfeeding Assessment Tool

The LATCH Breastfeeding Assessment Tool used to evaluate breastfeeding consists of five evaluation criteria. Each criterion is 10 points in total, to be evaluated in the range of 0–2 points. As a result of this measurement tool, the higher the score the mothers get, the higher their breastfeeding success. The Cronbach's alpha value for this study was determined to be 0.86.

Breastfeeding Self-Efficacy Scale

The scale, which has a 5-point Likert characteristic, consists of 14 items. A minimum of 14 points and a maximum of 70 points can be obtained, and higher scores indicate higher breastfeeding self-efficacy. The Cronbach's alpha value for this study was determined to be 0.82.

Redness, Edema, Ecchymosis, Discharge, and Approximation Scale

This scale covers five factors that indicate perineal wound healing: redness, edema, ecchymosis, discharge, and approximation. The sum of the scores obtained from the evaluation of the five categories creates the REEDA score. The lowest score is 0, while the highest score is 15. The highest score indicates severe perineal trauma.

Implementation of the research

Depending on the clinical decision to stimulate or increase the labor process, those who received an oxytocin infusion were defined as the case group. In contrast, spontaneously followed pregnant women who did not receive an oxytocin infusion formed the control group. The decision for oxytocin induction was made by the obstetrician in charge of the obstetric unit, independent of the study (there were three obstetricians in the clinic at the time of the study).

Oxytocin perfusion was created by diluting 5 IU of oxytocin into 500 mL of saline. Perfusion started with 4 mL/30 min of use. The oxytocin infusion was continued, doubling every 30 min until sufficient contractions were achieved (mean max: 76 mL/h). The fetal heartbeat monitoring was different in the oxytocin-administered and control groups—every 30 min in the former group, using electro-fetal monitoring (EFM), and every hour in the latter, using the EFM.

The amount of hemorrhage in the women was monitored during delivery with a PPH collection bag placed on the gynecological table. Women who gave birth generally in the institution where the study was conducted were discharged 24 h after delivery. The amount of bleeding until discharge was evaluated by weighing the pads and mattress protectors on a precision scale. The mattress protectors and pads used had standard sizes, and their dry weights were similar.

After birth, routine care was applied to the infants of the mothers in the oxytocin and control groups. As part of routine care, umbilical cords were clamped within 30–60 s as soon as the infants were born. Infants were placed under a radiant heater to receive standard care (vitamin K and hepatitis B vaccine application). Before discharge, mothers in both groups were given routine breastfeeding training by the clinic nurse.

The BSES and LATCH Breastfeeding Assessment Tool were applied to women in the case and control groups at the end of the postpartum 24th hour and 1st week. The 12th- and 24th-hour postpartum REEDA scale was applied.

The research data were analyzed in the SPSS 21.0 software. In the comparisons between the groups, when parametric assumptions were not provided for the quantitative variables, the Mann-Whitney U test was used in the independent sample constructs, and the Wilcoxon test was applied in the dependent constructs. Statistical analyses were performed using chi-square tests to compare women's characteristics between the two groups.

RESULTS

It was determined that the mean age of the women included in the study was 23.94±4.27 years, 47.1% of them were primary school graduates, by a majority, and the average gestational week was 39.10±0.98. There was no significant difference between the mean age, education level, gestational week, and prenatal hemogram (HGB) and hematocrit (HCT) counts of the pregnant women in the case and control groups (Table 1).

While it was determined that the first stage of labor was significantly shorter in the case group in which oxytocin

Table 1. Comparison of the characteristics of the groups.

	Case group (n=44)	Control group (n=44)	Tests/p
	Mean±SD	Mean±SD	
*First stage of labor total time (h)	3.24±2.97	8.63±4.16	[a]z=-5.246
			p=0.006
Second stage of labor total time (min)	33.88±13.94	20.44±8.93	[a]z=-4.210
			p=0.000
Third stage of labor total time (min)	9.80±4.93	6.85±2.99	[a]z=-2.775
			p=0.000
1-min Apgar scores	7.94±0.23	8.02±0.38	[a]z=-1.117
			p=0.264
5-min Apgar scores	9.20±0.47	9.65±0.48	[a]z=-3.634
			p=0.132
Prenatal hemogram	11.57±0.99	12.04±1.13	[a]z=-1.547
			p=0.122
Postpartum hemogram	10.04±1.42	10.64±1.08	[a]z=-1.387
			p=0.165
	**z=-4.840	**z=-5.090	
	p=0.000	**p=0.000**	
Prenatal hematocrit	35.19±2.72	36.64±3.05	[a]z=-1.933
			p=0.053
Postpartum hematocrit	30.96±3.65	32.74±3.08	[a]z=-1.592
			p=0.111
	**z=-4.890	**z=-5.087	
	p=0.000	**p=0.000**	
Postpartum blood collection bag (mL)	422.14±265.32	270.00±156.33	[a]z=-2.833
			p=0.005
Pad bleeding amount (mL)	172.00±67.42	127.14±38.69	[a]z=-3.022
			p=0.003
Total postpartum blood loss	594.14±277.19	397.14±175.47	[a]z=-3.350
			p=0.001

[a]Mann-Whitney U test. *The duration of the first stage of labor was calculated from the active phase.**Wilcoxon signed-rank test. Significant p-value are indicated in bold.

induction was administered, it was determined that the second and third stages of labor lasted significantly longer than the control group.

There was no significant difference between the weights and 1st and 5th-minute Apgar scores of newborns in the case and control groups. It was determined that 42.9% of newborns were females and 57.1% were males.

It was determined that there was no significant difference between the first evaluation (LATCH 24th hour) and the last evaluation (LATCH 1st week) in the case and control groups (Table 2).

When the mean BSES scores of the groups were examined, it was determined that there was no significant difference between the mean scores of the 24th-hour BSES and the first week in the case and control groups, while there was a significant difference between the first evaluation (24th-hour BSES) and the last evaluation (first-week BSES) in the case and control groups (Table 2).

When the perineal integrity of the groups was evaluated, it was determined that 47.7% of the women who underwent oxytocin induction had 1st or 2nd degree lacerations and 11.4% had 3rd or 4th degree lacerations. In the control group, 20.5% of the women had 1st or 2nd degree lacerations and 2.3% had 3rd or 4th degree lacerations.

While episiotomy was applied to 79.5% of the oxytocin group, it was determined that 75% of the control group

Table 2. Comparison of the groups' LATCH Breastfeeding Assessment Tool and Breastfeeding Self-Efficacy Scale score averages.

	Case group (n=44)	Control group (n=44)	Tests/p
	Mean±SD	Mean±SD	
Frequency of breastfeeding in the first 24 h	8.42±1.04	9.01±1.23	[a]p=0.623
LATCH Breastfeeding Assessment Tool 24th hour	8.91±1.63	9.14±1.84	[a]z=-1.047
			p=0.295
LATCH Breastfeeding Diagnostic Scale 1st week	9.26±1.04	9.28±1.63	[a]z=-0.922
			p=0.357
	[b]z=-1.615	[b]z=-0.607	
	p=0.106	p=0.544	
BSES 24th hour	60.50±8.21	61.45±6.77	[a]z=-0.268
			p=0.789
BSES 1st week	68.45±2.51	68.81±2.35	[a]z=-1.479
			p=0.139
	[b]z=-5.781	[b]z=-5.786	
	p=0.000	**p=0.000**	
REEDA 12th hour	2.77±1.73	0.54±1.12	[a]z=-5.323
			p=0.000
REEDA 24th hour	2.60±1.61	1.01±0.17	[a]z=-5.397
			p=0.000
	[b]z=-0.900	[b]z=-1.414	
	p=0.368	p=0.157	
	N	**n**	**Tests**
1st and 2nd degree lacerations	21	9	[c]X^2=13.585
			p=0.000
3rd and 4th degree lacerations	5	1	[d]X^2=0.055
			p=0.028
Episiotomy	35	33	[e]X^2=0.259
			p=0.611

[a]Mann-Whitney U test. [b]Wilcoxon signed-rank test. [c]Pearson's chi-square test. [d]Continuity (Yates) correction. [e]Fisher's exact test. BSES: Breastfeeding Self-Efficacy Scale; LATCH: LATCH Breastfeeding Assessment Tool. Significant p-values are indicated in bold.

underwent episiotomy, and no significant difference was found between the groups.

DISCUSSION

Routine administration of an oxytocin infusion without a valid indication based on evidence is of particular concern for the risk of PPH[2]. In the Grotegut et al.'s[4] study, oxytocin exposure was investigated in cases with blood transfusion, severe PPH, and PPH secondary to uterine atony. Women with severe PPH secondary to uterine atony have been reported to be exposed to significantly more oxytocin compared to the control group. In a population-based case (n=1483)–control (n=1785) study, the administration of SynOT during labor was reported to be an independent risk factor for severe PPH[11]. The research results support the literature, and it was determined that the amount of hemorrhage was significantly higher in the oxytocin induction group. The fact that the second stage of labor lasted longer in the case group compared to the control group explains the high amount of hemorrhage[12].

In the literature, there are different results of studies on the effects of oxytocin induction on the perineum[7,10,13]. Santos et al.[9] in their study with nulliparous women, determined that there was a significant relationship between the use of SynOT induction and perineal trauma. Similarly, Klokk et al.[13] reported that augmentation with oxytocin is an independent risk factor for obstetric anal sphincter injury in primiparous and multiparous women. Despite these findings, Oliveira et al.[7] in a retrospective study conducted in a public hospital, reported that no significant relationship exists between SynOT and spontaneous perineal lacerations. It has also been reported that this result may be related to other interventions, such as the oxytocin protocol, labor analgesia, and episiotomy. In this study, when the perineum was evaluated according to the REEDA scale and lacerations were considered, it was determined that perineal damage was significantly higher in the SynOT induction group. This study found that the implementation of episiotomy could not be evaluated objectively because in the hospital where the research was conducted, episiotomy is mainly preferred in primiparous mothers.

The literature states that SynOT induction administered before the onset of labor may affect breastfeeding[14]. Bai et al.[14] reported in their study on women living in Hong Kong that the duration of exclusive breastfeeding for the infants of mothers who received oxytocin induction was significantly lower than that of those who did not receive any intervention, and that induced labor shortened the duration of breastfeeding. In this study, it was determined that the breastfeeding status, breastfeeding frequency in the first 24 h, and breastfeeding self-efficacy were similar according to the LATCH scale of the mothers who had and did not receive oxytocin induction. The existing studies cannot reveal the effects of SynOT induction on breastfeeding, mainly due to the differences in oxytocin administration protocols. For this reason, healthcare professionals should be careful about breastfeeding difficulties in women and newborns receiving oxytocin.

Limitations

There were some limitations to the study, such as the fact that it was conducted in a single center and that PPH was evaluated within the first 24 h after delivery. In addition, the management of labor was carried out by three different physicians working in the clinic. This situation may affect many findings, such as the SynOT induction decision, episiotomy decision and repair, and perineal damage.

CONCLUSION

According to the study findings, it was determined that oxytocin induction administered in the first stage of labor increased hemorrhage and perineal trauma in the early postpartum period but did not affect breastfeeding outcomes. These results may provide healthcare professionals with a better understanding of the effects of oxytocin administration when making clinical decisions.

ETHICAL ASPECT OF THE STUDY

Zeynep Kamil Women and Children's Diseases Training and Research Hospital Clinical Research Ethics Committee permission (approval number: 76/2019.24.07) and institutional permission were obtained from the institution where the study was conducted.

AUTHORS' CONTRIBUTIONS

YAK: Conceptualization, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **LK**: Conceptualization, Investigation, Methodology, Writing – review & editing. **SY**: Conceptualization, Investigation, Writing – review & editing.

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