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The Use of Oxytocin by Healthcare Professionals During Labor

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ABSTRACT

Background Oxytocin is widely used in perinatal medicine, but it can cause serious side effects. Health professionals should be familiar with the pharmacokinetics, dosing regimen, and fetal effects of oxytocin. This study aims to explore the use of oxytocin by healthcare professionals during labor.

Methods This study was conducted in one medical faculty, one training and research hospital, one maternity hospital, and one private hospital in Adana, Turkey. The sample group included 107 participants. The data were gathered using a survey prepared in line with the literature. The survey was comprised of 30 questions. These questions concern the social demographic information of the participants, the knowledge and actual oxytocin use, and the views of the participants. The data were analyzed using descriptive statistics.

Results The average age of the participants was 36.76 ± 8.70 years, the mean of working experience in the delivery room was 7.79 ± 7.73 years. 85.6% of the participants who answered the question of possible effects of oxytocin as contraction, 57.9% of the possible side effects as fetal distress. 69.2% of the participants stated that they applied oxytocin after dilution in a fluid while 47% stated that they applied it after dilution in fluid with 5% Dextrose. While 40% of the participants responded that they sometimes forgot to administer medication, 39.2% stated that they did not register medication in their survey responses.

Conclusion It was determined that most of the participants answered the questions about the effect of oxytocin correctly, but they could not respond to all the side effects of oxytocin. It was found that most of the participants could not answer the storage conditions that are important for the effectiveness of the drug correctly. In addition, the importance level given to the principles of drug administration by the participants was generally found to be high.

Key words doctor; labor; midwife; nurse; oxytocin

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Synthetic oxytocin is the most commonly used means of inducing labor. However, the inappropriate use of certain drugs, called high-risk drugs, can cause significant damage to the patient.[1] Consequently, the USA-based Institute for Safe Medication Practices placed the intravenous use of oxytocin in a 'high-risk category' in 2007.[2]

While stimulating labor, the use of oxytocin could lead to contraindications associated with uterine, maternal, and fetal causes. Prior to labor induction, risk and favor–disfavor assessment must be fully undertaken for both the mother and the baby; inducing labor may cause undesirable consequences and outcomes both for the mother and the baby.[1] Synthetic oxytocin can be used to intensify or induce labor pain and to prevent postpartum bleeding. Despite its certain capacity to save lives, synthetic oxytocin simultaneously involves risks and can cause significant harm to the mother and the baby if used incorrectly. Although it is common knowledge that the use of synthetic oxytocin facilitates labor, it can also reduce the amount of oxytocin in women's body, consequently desensitizing the patient against their own oxytocin.[2]

The correlation between oxytocin and hyperstimulation, fetal distress, and adverse neonatal consequences is known well. Indeed, in the case of uterine hyperactivity, reparative disruptions resulting from contractions can lead to adverse perinatal consequences related to fetal hypoxia.[3, 4] Reducing the amount of synthetic oxytocin during labor is important for analyzing and assessing dystocia management practices.[4, 5] Risks posed to the fetus due to oxytocin use means that careful management and safe use and application of oxytocin are vital.[5] Improper oxytocin use during labor is dangerous both for the mother and the baby.[6] Early or late use can be related to the progress of labor dystocia. Labor dystocia is one of the main causes of increased maternal morbidity and operative delivery.[7]

Synthetic oxytocin is a commonly used drug during delivery and after birth.[1] For this reason, the mechanism of action and side effects should be known well by healthcare professionals. Some studies evaluated the effects of synthetic oxytocin, which is widely used in our country for inducing labor, on maternal and neonatal health in the postpartum period. In studies

conducted, it is stated that synthetic oxytocin used during labor may cause complications such as disruption of the natural oxytocin system in the mother, postpartum hemorrhage, depression, and breastfeeding difficulties. In addition, it has been stated that hyperbilirubinemia can be seen in the newborn, and suction problems may occur as a result of the effects on reflexes associated with sucking.[3, 4, 8] The World Health Organization does not recommend routine use of oxytocin to speed up delivery in the intrapartum care guide for positive delivery experience.[9] When the literature is examined, there are a few studies in the world about the use of oxytocin during labor.[10–12] In the qualitative study of Deepak and others involving 140 health workers and community members in India, the current knowledge, attitudes, and practices of the participants on the use of uterotonic in labor and delivery were evaluated.[10] In the qualitative study conducted by Oliver et al., which included 158 healthcare providers (pharmacists, midwives, nurses, doctors, and obstetricians) and 40 key informants (supply chain experts, program managers, and policy-makers), the perspectives and practices of the participants about oxytocin use, storage conditions and preventing factors and quality were evaluated.[11] Another study was conducted in Lagos State, Nigeria, to assess clinical experiences with the quality of oxytocin used by healthcare providers.[12] In Turkey, only one study was found to have evaluated the use of oxytocin by healthcare professionals for the use of synthetic oxytocin.[13] This study is important and valuable due to the limited number of studies in the literature. This descriptive study aims to explore the use of oxytocin by healthcare professionals during labor.

MATERIALS AND METHODS

Research population and sample

The research population for this study includes all healthcare professionals (doctors, midwives, nurses) working at the delivery room of a medical faculty hospital, a training and research hospital, a maternal hospital, and a private hospital in Adana, southern Turkey. A total of 132 healthcare professionals work in these hospitals. OpenEpi, version 3, statistical software was used to calculate the sample size. The sample size was calculated with 95% confidence interval, 5% margin of error, which indicated the population of 80%, at least 99 health professionals to represent (power) the population.[14] This study's sample group consists of 107 healthcare professionals; this included all healthcare professionals who had worked in the aforementioned hospitals between 1st and 30th May 2017 and who agreed to participate in the study on a voluntary basis. Overall, 81% of the research population was reached.

Data collection forms

The study data were gathered using a survey form. This survey form was developed in line with the existing literature studies.[7, 13, 15–19]

The survey was comprised of 30 questions; seven questions concern socio-demographical information of participants, while 23 questions concern the knowledge (5) and actual use (17) of oxytocin by healthcare professionals and a participant's views.

Additionally, in the questionnaire, possible mistakes that healthcare professionals may encounter regarding oxytocin administration were asked based on the principles of drug administration. The participants were asked to rate the frequency of encountering these mistakes as "Never, Sometimes, Usually." The principles of drug administration: The right patient, the right medicine, the right effect, the right dose, the right route, the right medicine form, the right time, the right record.[17] In addition, the participants were asked to score between 0 and 10, with the degree of finding the important mistakes encountered as "0 = Insignificant, 10 = Very important."

The data were collected by the researchers from the participants based on the self-report method. The questions in the content of the survey were basically multiple choice, with some requiring yes/no answers or answers accordingly on scales. Only the question about the views of the participants was open-ended. The questions left blank in the questionnaire were not analyzed.

Statistical analyses

The participants' responses on socio-demographic information and oxytocin use were analyzed using descriptive statistics (numbers, percentages, and average analyses) in the Statistical Package for Social Sciences (SPSS) 20.0 program (IBM, Armonk, NY).

Ethical aspects of the study

Approval to conduct this study was received from Cukurova University, Faculty of Medicine Ethics Committee (Date: 7.4.2017; Permission no: 2017/76/30). All information and data used in this study were collected from the participants on a voluntary basis and according to the participants' consent.

RESULTS

The average age of the participants was 36.76 ± 8.70 (min: 21, max: 64) years, the total working experience was 14.43 ± 8.80 (min: 1, max: 37) years, and the working experience in the delivery room was 7.79 ± 7.73 (min:

Table 1. Participants' socio-demographic information

Socio-demographic aspects	*n*	%
Age (years) (Mean ± SD = 36.76 ± 8.70) (min: 21, max: 64)		
Total working experience (years) (Mean ± SD = 14.43 ± 8.80) (min: 1, max: 37)		
Working experience in delivery room (years) (Mean ± SD = 7.79 ± 7.73) (min:0–1, max: 34)		
Sex		
Male	13	12.1
Female	94	87.9
Profession		
Doctor	23	21.5
Midwife	79	73.8
Nurse	5	4.7
Graduated from		
Medical faculty	23	21.5
Faculty of health sciences/Health collage	67	62.6
Healthcare high school	9	8.4
Other	8	7.5
Workplace		
Maternity hospital	46	43.0
Medical faculty hospital	10	9.3
Private hospital	14	13.1
Training and research hospital	23	21.5
Total	107	100

0–1, max: 34) years. Furthermore, 87.6% were females, 73.8% were midwives, 62.6% were graduates of a Healthcare Sciences Faculty/Healthcare Collage, and 43% worked in a maternity hospital. (Table 1).

The study revealed that 85.6% (n = 97) of the participants knew that contractions were an effect of oxytocin use; 57.9% (n = 95) knew that fetal distress was a possible side effect of oxytocin; and 64.7% (n = 17) knew that oxytocin interacted with uterotonics. Additionally, 98.1% (n = 103) reportedly knew the correct storage conditions of oxytocin, and 49.4% (n = 83) knew that oxytocin should be stored at 2–8°C (Table 2).

The distribution of the data on the participants' use of oxytocin is presented in Table 3. Overall, 69.2% (n = 104) of the participants stated that they applied oxytocin as a fluid; of these, 47% (n = 100) responded that they applied it in a fluid of 5% Dextrose. Furthermore, 90.3% (n = 103) of participants responded that they applied oxytocin according to a doctor's request, while 30% (n = 80) of participants said that they paid attention to infusion speed and duration when preparing and applying oxytocin. A total of 26.3% (n = 80) of the participants responded that they paid attention to oxytocin dose while 26.3% (n = 80) said that they tracked oxytocin use with non-stress test and fetal monitoring; 94.2% (n = 103) responded that they paid attention to the expiry date of the oxytocin they applied. Overall, 90.7% (n = 107) of participants responded that they did not make mistakes while applying oxytocin while 32.7% (n = 107) responded that they had encountered mistakes during the application; 40.4% (n = 99) said that they notified the relevant individual when such mistakes are experienced. Concerning the parameters to be considered while preparing and applying oxytocin, the participants' responses revealed that they were aware of either four, three, or two principles of drug administration. As each participant who knew the principles of drug administration stated a different principle, the principles were given as numbers.

Concerning the mistakes encountered about the drug administration, the participants' responses revealed they did not encounter any mistakes about the application and use of oxytocin. Overall, 40% of the participants responded that they sometimes forgot to administer the medication, 39.2% responded that they sometimes forgot to register the medication, 33.3% of

Table 2. Percentage of participants with knowledge about the use of oxytocin

Data	*n*	%
*Possible effects of oxytocin (*n*† = 97)		
Contraction	83	85.6
Controls postpartum bleeding	18	18.6
Dilatation and effacement	11	11.3
Ensures milk flow/lactation	9	9.3
Accelerates labor	9	9.3
Supports uterus after labor	7	7.2
Other	12	12.3
*Possible side effects of oxytocin (*n*† = 95)		
Fetal distress	55	57.9
Rupture	39	41.1
Tetanic contractions	28	29.5
Tachycardia/bradycardia	16	16.8
Fluid retention	9	9.5
Hypotension/hypertension	7	7.4
Atonia	5	5.3
Lacerations	4	4.2
Other	17	18.2
*Drug interaction (*n*† = 17)		
Uterotonics	11	64.7
Magnesium sulphate	4	23.5
Narcotics	2	11.8
Analgesics	2	11.8
Other	3	17.7
Do you have information on storage conditions of oxytocin? (*n*†= 103)		
Yes	101	98.1
No	2	1.9
*Storage condition‡ (*n*† = 83)		
2–8°C	41	49.4
Refrigerator	15	18.1
4°C	11	13.3
Cold chain	9	10.8
Protection against heat and light	8	9.6
Other	9	10.8

*Participants provided more than one choice. †Only participants who answered the questions. ‡Storage conditions are based on the instruction manual for the use of Synpitan Forte (Deva Holding, Istanbul, Turkey).[19]

participants responded that they sometimes application to wrong speed and 31.4% of participants responded that they sometimes not observing the effect of the drug. 31% of participants responded that they sometimes application to wrong dose, 30.1% of participants responded that they sometimes application to wrong time, 18.6% of participants responded that they sometimes application to wrong method, 17.5% of participants responded that they sometimes application to wrong drug and 12.9% of participants responded that they sometimes application to wrong patient (Table 4).

When the participant's responses regarding the use

Table 3. Distribution of data on participants' usage and error experience when applying oxytocin

Oxytocin application	*n*	%
Oxytocin application methods (*n*† = 104)		
In fluid	72	69.2
Fluid + IM	17	16.3
Fluid + IV push + IM	9	8.7
Fluid + IV push	6	5.8
Decision on using oxytocin (*n*† = 103)		
Doctor's request	93	90.3
Doctor's request + Hospital protocol	3	2.9
Doctor's request + Hospital protocol + My personal decision	3	2.9
Doctor's request + Routinely on each labor	2	1.9
Doctor's request + My personal decision	1	1.0
Hospital protocol	1	1.0
Frequently used fluids while applying oxytocin (*n*† = 100)		
5% Dextrose	47	47.0
Normal saline	16	16.0
Ringer lactate	15	15.0
5% dextrose + NS	10	10.0
5% dextrose + RL	9	9.0
Other (NS + RL, 5% dextrose + NS + RL, all fluids)	3	3.0
*Parameters taken into consideration while preparing and applying oxytocin (*n*† = 80)		
Infusion speed and duration	24	30.0
Non-stress test and fetal monitoring	21	26.3
Dose	21	26.3
Storage conditions	14	17.5
Doctor's request	12	15.0
Three of the principles of drug administration‡	11	13.8
Four of the principles of drug administration‡	9	11.3
Application mean and method	8	10.0
The vital signs of the patients§	7	8.8
Two of the principles of drug administration‡	7	8.8
Other	13	17.7
Tracking oxytocin's date of expiry (*n*† = 103)		
Yes	97	94.2
No	6	5.8
Making an error while applying oxytocin (*n* = 107)		
Yes	10	9.3
No	97	90.7
Encountering an error while applying oxytocin (*n* = 107)		
Yes	35	32.7
No	72	67.3
Notifying about drug errors related to oxytocin (*n*† = 99)		
Yes	40	40.4
No	59	59.6

*Participants provided more than one choice. †Only participants who answered the questions. ‡Number of principles that they know correctly from the principles of drug administration (the right patient, the right medicine, the right effect, the right dose, the right route, the right medicine form, the right time, the right record). §Body temperature, pulse rate, respiration rate, blood pressure of patient. IM, intramuscular; IV, intravenous; NS, normal saline; RL, ringer lactate.

Table 4. Frequency of errors encountered by participants concerning oxytocin use

Errors encountered	Occurrence frequency						Scores given by participants for errors according to their importance (on a scale of 1–10)
	Never		Sometimes		Usually		Mean ± SD
	n	%	*n*	%	*n*	%	
Wrong drug (*n* = 103)	85	82.5	18	17.5	–	–	9.75 ± 1.23
Wrong dose (*n* = 103)	70	68.0	32	31.0	1	1.0	9.49 ± 1.50
Wrong method (*n* = 102)	83	81.4	19	18.6	–	–	9.54 ± 1.74
Wrong time (*n* = 103)	66	64.1	31	30.1	6	5.8	9.03 ± 2.01
Wrong speed (*n* = 102)	63	61.8	34	33.3	5	4.9	9.37 ± 1.72
Wrong patient (*n* = 101)	87	86.1	13	12.9	1	1.0	9.72 ± 1.21
Forgetting to administer the drug (*n* = 100)	60	60.0	40	40.0	–	–	9.07 ± 2.03
Not registering the drug (*n* = 102)	60	58.8	40	39.2	2	2.0	9.22 ± 1.87
Not observing the effect of the drug (*n* = 102)	65	63.7	32	31.4	5	4.9	9.46 ± 1.63

Table 5. Breakdown of participants' views on oxytocin application during labor

Participants' views (*n* = 12)	*n*	%
Regular use of oxytocin must be avoided	7	58.8
Intervention-free labors must be increased	4	33.3
Healthcare staff must be trained	2	16.7
Frequent follow-up	2	16.7
Infusion pump must be used during oxytocin practice	1	8.3

of oxytocin use were examined, the data revealed that 58.8% responded with "regular use of oxytocin must be avoided"; 33.3% responded "intervention-free labors must be increased"; 16,7% responded that "healthcare staff must be trained"; 16.7% mentioned that "frequent follow-ups must be performed"; and, 8.3% responded that "[an] infusion pump must be used during oxytocin practice" (*n* = 12) (Table 5).

DISCUSSION

This descriptive study aimed to evaluate the use of oxytocin by healthcare professionals during labor. It was conducted with the participation of 107 health professionals working in medical centers in Adana, Turkey. Synthetic oxytocin is among the most common means of inducing labor in Turkey. Natural oxytocin synthesized in the hypothalamus during vaginal delivery has a uterotonic effect by increasing uterine contractions. Synthetic oxytocin induction is physiologically similar to that of normal labor. Intravenous oxytocin response is observed within 3–5 minutes and plasma reaches a steady state after 40 minutes.[20] Only one study in Turkey was found to have evaluated the healthcare professionals' use of oxytocin and the difficulties they encountered.[13] It is highly important for physicians, midwives, and nurses to be sensitive and knowledgeable about the use of oxytocin during labor, as well as the related complications that may affect fetal and maternal health during oxytocin administration.

This study examines the knowledge level of the participants regarding the use of oxytocin. The data were collected from healthcare professionals, which revealed that most of the health workers knew or were aware of the stimulating effect of oxytocin regarding uterine contractions, the most important effect of oxytocin. Furthermore, the study data revealed that more than half of the healthcare professionals were aware that oxytocin could cause fetal distress.

Although the majority of the participants stated that they knew the correct storage conditions for oxytocin, it was found that more than half of the correct storage conditions could not be answered. In the study of Oliver

et al., it was reported that stakeholder awareness of oxytocin heat sensitivity and the requirement for cold storage of the drug was widespread in Ethiopia but more limited in Myanmar and India.[11] In line with the results of the present study, the study conducted by Ejekam et al. reported that approximately half of the participants and Deepak et al. stated that most of their participants did not know the storage conditions of oxytocin.[10, 12] The results showed that healthcare professionals did not have enough knowledge about the storage of oxytocin.

When health workers' oxytocin applications were evaluated, it was determined that the majority of healthcare workers knew that oxytocin should be given in 5% Dextrose solution, in accordance with doctors' orders, and administered within the expiry date. However, it was determined that health workers did not have enough knowledge about monitoring the oxytocin dose, infusion rate, duration, and non-stress test, as well as fetal monitorization, which are important during administration. Additionally, it was found that the participants could not answer the eight principles of drug administration that are important for drug safety during the preparation and administration of oxytocin. Deepak et al. stated both health providers and chemists appeared to have incomplete and inconsistent knowledge about uterotonics, including appropriate dosage and required monitoring.[10] The results of the present study is parallel with Deepak et al.'s study.

Synthetic oxytocin is widely used in a number of countries; indeed, it is used in more than half of all cases of labor. There is no standard protocol published by the Ministry of Health to initiate oxytocin induction during the labor in Turkey. Written protocols of each hospital are prepared by their own institutions in accordance with current clinical evidence and updated when necessary. In addition, the oxytocin application protocols differ in hospitals. Although no data exists concerning the frequency of oxytocin use in clinical birth cases in Turkey, induction through oxytocin is frequently used to initiate labor.[13, 20] It is important to remember that midwives and nurses are the health professionals who follow both the mother and the fetus during labor and therefore are likely to be the first ones to determine or detect the development of a negative situation or outcome. The role of health personnel regarding oxytocin use is vital for protecting the fetus and maintaining maternal health. This study showed that health professionals' competence about the use of oxytocin was at the knowledge level; there is a need for forming protocol for the use of oxytocin use.

Improper drug or medication use are among the most common medical mistakes; such mistakes might include an incorrect drug choice, dosage, option, or technique by the health professional administering drugs.[15] Every drug mistake that harms the safety and health of a patient creates additional costs for both health services and institutions. The majority of drug mistakes can be prevented without harming the patient. A total of 18 drugs are identified in the high-risk category of drugs, with synthetic oxytocin also being included in the first 12 'high-risk' items.[21] Incorrect use of oxytocin may cause damage to the mother and her fetus. Nearly one-third of the health professionals participating in the study reported that mistakes were made regarding their administration of oxytocin, while more than half did not report making a mistake. In this study, health professionals are expected to be more sensitive about mistakes during oxytocin administration to protect the fetus and maternal health.

More than half the participants of this study who shared their opinions regarding oxytocin use during labor indicated that they avoided routine oxytocin use, and about one-third responded that they thought the number of non-invasive labors should increase. In the study conducted by Demirci, et al. (2005), 16% of physicians that they had used oxytocin to accelerate normal labor.[13] The rate and prevalence of complications within pregnancies involving synthetic oxytocin use are higher than those of natural pregnancies.[22] Oxytocin increases the duration and severity of uterine contractions and can lead to uteroplacental perfusion and fetal distress. Consequently, the administration of oxytocin should not be performed routinely; rather, it should be applied cautiously, carefully, and only when needed.[23] Today, the basic approach to pregnancy and labor is that it is a physiological process that demands minimal medical intervention. Natural childbirth without intervention is undertaken as much as possible.[24] In their study that investigated the opinions of nurses, midwives, and physicians concerning mother-friendly labor practices, Olgaç and Karaçam (2017) found that 70.5% of their study participants agreed with the opinion that routine induction should not be performed during labor.[25] In our study, the opinions of health professionals supporting natural birth are also satisfactory.

In conclusion, it was determined that most of the participants answered the questions about the effect of oxytocin correctly, but they could not respond to all the side effects of oxytocin. It was found that most of the participants were not able to answer questions related to the interaction of oxytocin with other medicines correctly; they also could not answer the storage conditions that are important for the effectiveness of the drug correctly. In addition, the importance level given to the

principles of drug administration by the participants was generally found to be high.

In this regard, the correct use of oxytocin, a high-risk and frequently-used drug in obstetrics should be known by all healthcare professionals. It is thought that the results obtained from this study conducted to evaluate the use of oxytocin during delivery by healthcare professionals working in delivery rooms will increase the awareness of healthcare professionals about the importance of oxytocin use at labor. It is recommended that health professionals be given in-service trainings that are repeated within the scope of medicine and patient safety in line with special medicines for the unit they work with.

LIMITATIONS OF THE RESEARCH

This study has some limitations. The participants did not answer some questions. Since the questions were answered by the self-report method, no interventions were performed for the questions that remained unanswered. Therefore, only the questions answered by the participants were evaluated. In addition, these results of the study are valid for the sample group in Adana, Turkey. Therefore, they can not be generalized.

The authors declare no conflict of interest.

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