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**Oxytocin Therapy Among Parturient Women in A University Hospital in Benin City, Nigeria**

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**Background:** Synthetic oxytocin is commonly used for labour management. There is no clear evidence to recommend a particular regimen of oxytocin in labour. This study was designed to document our experience with the use of oxytocin during labour and delivery with a view to improving maternal and perinatal outcome. **Methods:** We conducted a retrospective study of consecutive deliveries from July to December 2019 in the Department of Obstetrics and Gynaecology, University of Benin Teaching Hospital, Benin City, Nigeria, including all women who had oxytocin administered in the setting of labour and delivery. The data was subjected to statistical analysis with SPSS version 20.0 and GraphPad InStat 3, and P value < 0.05 was adjudged to be statistically significant. **Results:** Of 1,275 women who delivered in the period studied, 620 (50.2%) had oxytocin for induction of labour, 13.4% had stimulation of uterine contractions following rupture of membranes, and 36.4% had augmentation of labour. Almost 70% of the women delivered within 8h of initiating oxytocin therapy, 3% had oxytocin beyond 12h, and about 30% of them required the maximum dose of 32mU/min. Vaginal delivery occurred in 76% of the women. We did not find any significant predictor of vaginal delivery. And no complications of oxytocin use were recorded**.** **Conclusion**: Vaginal delivery rate is good among parturient women treated with oxytocin in labour in our hospital. With adequate monitoring and appropriate management, maternal and perinatal complications are rare.

**Keywords:** Augmentation of labour,Induction of labour, Oxytocin, Parturient women, Vaginal delivery

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**Introduction**

Induction and augmentation of labour appear to be inevitable in obstetric practice. Induction of labour (IOL) is indicated for medical, obstetric, or fetal conditions when extrauterine life is adjudged to be more beneficial than continued intrauterine existence. Augmentation of labour (AOL) is needed to improve uterine contractions for a woman in established labour with the aim of achieving vaginal delivery. Synthetic oxytocin is widely used for both induction and augmentation of labour.1 When used for

AOL, it reduces the time to delivery interval, not necessarily the number of Caesarean sections performed,1,2 but there is a potential for averting Caesarean sections,2 especially by modifying oxytocin therapy to specific clinical settings.3

Various guidelines have been developed on the use of oxytocin. Infusion of oxytocin up to 10mU/min mimics the range attained during physiological birth.1 Various regimens of oxytocin incremental intervals have been documented in the literature.5 The concept of low and high dose oxytocin has also been introduced.4,5 However, these guidelines are yet to be unified. After about 70 years of use in clinical practice, there is no universally accepted optimal oxytocin infusion regimen.1 It may therefore be appropriate for each obstetric unit to have a written protocol for the management of parturient women with oxytocin. This may be guided by local data and availability of resources. Intervals for increasing infusion rate of 30 to 60 minutes appear adequate based on the known pharmacological half-life of 15 minutes.6

The use of oxytocin in labour merits caution because of the associated risks of uterine hyperstimulation, placental abruption, amniotic fluid embolism, water intoxication and uterine rupture.1 The use of oxytocin infusion in labour is also associated with increased pain and stress for the mother.1 It may increase the risk of fetal asphyxia as it decreases the resting time between contractions.2 In low-resource settings, where facilities for intrapartum monitoring are often inadequate, there is the need to evaluate the potential benefit and risk of oxytocin use for parturient women.

Previous studies have reported on the utility and risks of oxytocin use in labour, examining different dose regimens. There is no consensus on the recommendation for a particular dose or pattern of use of oxytocin. In the present study, we sought to share our experience with the use of oxytocin in labour with a view to improving maternal and perinatal outcome.

**Materials and methods**

We conducted a retrospective study in the Department of Obstetrics and Gynaecology of the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria from July 2019 to December 2019. The study included all women who had oxytocin administered in the setting of labour and delivery. Women who had chronic medical conditions like hypertension and diabetes, multiple gestation, and incomplete information on their management were excluded from the review.

UBTH is a major tertiary referral centre in the South-South region of the country. The average delivery rate in the hospital in the preceding five years has been 3,000 per year, which gives a monthly delivery rate of 250. The labour ward has 10 delivery suites. The attendance rate at the 6-week postnatal clinic is between 40 and 70%. The hospital has a total antenatal and postnatal bed capacity of 82 spaces, and there are 2 obstetric theatres attached to the labour ward.

In UBTH, oxytocin is used for labour management in the form of IOL, stimulation of uterine contractions following premature rupture of membranes, and AOL. The protocol for the use of oxytocin for labour management in UBTH has previously been documented.7 In the present study, oxytocin dose was commenced at 2mU/min and increased at 30min or 45min interval, according to the protocol. The maximum dose of oxytocin given was 32mU/min.

The records of all eligible women admitted for delivery in spontaneous labour or scheduled for IOL, or required AOL during the period of review were included. The information for this review was retrieved from the department’s databank, and supported by documentations in individual patient record, birth registers, the labour ward, obstetric theatres, and the lying-in wards. Data collected included maternal age, parity, gestational age, mode of delivery (spontaneous vertex, assisted vaginal breech, vacuum, forceps, Caesarean section), and the birth weight of the babies that were delivered. Additional information focused on maternal complications and adverse fetal outcome.

The data was subjected to statistical analysis with SPSS version 20.0 (SPSS IBM Corp, Armonk, NY) and GraphPad InStat 3 (GraphPad Software Inc., San Diego, CA). Univariate analysis was conducted using Chi-squared test or Fisher’s exact test as appropriate. Cross tabulation was done to determine associations, and results were presented as proportions and simple percentages displayed in tables. Binary logistic regression was conducted to predict vaginal delivery. Statistical significance was assumed at P value < 0.05.

**Results**

There were 1,275 women who delivered during the period under review. Of this number, 620 (48.6%) had oxytocin during labour and delivery. Over 76% (472/620) of them were within age bracket 20 to 34 years. Nulliparous women made up about a third (201/620). Almost 85% (525/620) had term deliveries. (Table 1).

Table 1: Socio-Demographic and Clinical Attributes of the Parturient

|  |  |
| --- | --- |
| Characteristic | Number (%) |
| Age (year)  < 20  20-34  ≥ 35 | 6 (1.0)  472 (76.1)  142 (22.9) |
| Parity  0  1-4  ≥ 5 | 201 (32.4)  403 (65.0)  16 (2.6) |
| \*GA at delivery (week)  < 37  ≥ 37 | 95 (15.3)  525 (84.7) |
| Body mass index (kg/m2)  Underweight  Normal  Overweight  Obese | 173 (27.9)  236 (38.1)  155 (25.0)  56 (9.0) |

\*GA gestational age

IOL rate in the population studied was 24.4% (311/1275). Spontaneous vertex delivery was achieved in 74.4% (461/620) while emergency Caesarean section was done for 24% (149/620) of the women. The need for blood transfusion within 24 hours of delivery was shown in about 1% of the women. (Table 2).

IOL was conducted for 50.2% (311/620) of the parturient. Premature rupture of membranes was the indication for oxytocin use in 13.4% (83/620) of the women while AOL was required in 36.4% (226/620) of the parturient (Table 4). Oxytocin was used for over 12 hours in only 3.9% (24/620) of the parturient while the majority (68.7%) delivered within 8 hours of instituting oxytocin therapy. The maximum dose of oxytocin administered to any woman was 32mU/min.

Table 2: Labour Outcomes Following Oxytocin Therapy

|  |  |
| --- | --- |
| Characteristic | Number (%) |
| Type of labour  Spontaneous  Induced  Stimulated | 226 (36.4)  311 (50.2)  83 (13.4) |
| Mode of delivery  \*SVD  \*ABD  Instrumental  \*EMCS | 461 (74.4)  3 (0.5)  7 (1.1)  149 (24.0) |
| Blood loss (ml)  <200  200-499  500-999  ≥1000 | 440 (71.0)  114 (18.4)  61 (9.8)  5(0.8) |
| Need for transfusion within 24h  Yes  No | 6 (1.0)  614 (99.0) |

\*SVD spontaneous vertex delivery, \*ABD assisted breech delivery, \*EMCS emergency Caesarean section

Live births were recorded in 93.7% (581/620) and over 96% had good Apgar scores (Table 3).

Table 3: Neonatal Outcome Following Exposure to Oxytocin

|  |  |
| --- | --- |
| Characteristic | Number (%) |
| Fetal status at birth  Alive  Stillbirth | 581 (93.7)  39 (6.3) |
| Apgar score  <7  ≥7 | 23 (3.7)  597 (96.3) |
| Birth weight (kg)  <2.5  ≥2.5 | 75 (12.1)  545 (87.9) |
| \*NICU admission  Yes  No | 27 (4.4)  593 (95.6) |

\*NICU neonatal intensive care unit

Whereas 23.3% (144/620) required a maximum dose less than 8mU/min, almost 30% (184/620) of them needed to have up to 32mU/min. The maximum dose of oxytocin used in labour did not affect the duration of labour (P=0.54), requirement for Caesarean section (P=0.51) or fetal status at birth (P=0.58). Women who were exposed to high doses of oxytocin within 8 hours of labour had 16% reduced rate of CS (P=0.023) whereas oxytocin use over 8 hours was 22% more likely to be associated with CS (P=0.001). (Information is not in table)

Table 4: Pattern of Oxytocin Intervention Among the Parturient

|  |  |
| --- | --- |
| Parameter | Number (%) |
| Indication for oxytocin therapy  Induction  Stimulation  Augmentation | 311 (50.2)  83 (13.4)  226 (36.4) |
| Maximum dose of oxytocin (mU/min)  <8  8-16  32 | 144 (23.3)  292 (47.0)  184 (29.7) |
| Duration of labour (hours)  <8  8-12  13-16  >16 | 426 (68.7)  170 (27.4)  19 (3.1)  5 (0.8) |

Table 5: Binary Logistic Regression to Predict Vaginal Delivery

|  |  |
| --- | --- |
| Variable | P value |
| Mode of delivery in previous pregnancy | 0.06 |
| Previous Caesarean section | 0.35 |
| Number of previous vaginal delivery | 0.83 |
| GA at delivery in index pregnancy | 0.87 |
| Type of labour in index pregnancy | 0.09 |
| Duration of oxytocin use | 0.17 |
| Maximum dose of oxytocin | 0.07 |
| Birth weight | 0.79 |

GA gestational age

Binary logistic regression was conducted to predict vaginal delivery in this group of women. The model precision was 84.9%. Both Omnibus (P=0.001) and Hosmer Lemeshow (P=0.790) tests were indicative of a good fit model with 20 to 31% of the variance in the dependent variable explained by the model. Mode of delivery in the previous pregnancy (P=0.001), presence of a uterine scar(P=0.001), number of previous vaginal deliveries(P=0.001), type of labour in index pregnancy (P=0.011), duration of oxytocin use (P=0.021), and maximum dose of oxytocin needed (P=0.027) were individual predictors of vaginal delivery in index pregnancy. In the final logistic regression model, there were no significant predictors of vaginal delivery (Table 5)

Mode of delivery in previous pregnancy, maximum dose of oxytocin, and type of labour in index pregnancy appeared close to level of significance. Emergency CS in a previous pregnancy increased the risk of repeat CS in index pregnancy 2-fold. Previous vaginal delivery increased the odds for a vaginal delivery in index pregnancy by 11%. In index pregnancy, spontaneous onset of labour increased the odds of vaginal delivery 13.5-fold, induction of labour increased odds for vaginal delivery 1.7-fold while stimulation of labour increased odds for vaginal delivery 1.4-fold. Women who required AOL had 4.9% decreased odds for vaginal delivery. (Information is not in table)

**Discussion**

The aim of oxytocin therapy in labour is to achieve vaginal delivery. Oxytocin is the preferred agent to achieve this but different modifications to its use have been introduced. In this study, oxytocin was used for induction of labour in 50.2%, stimulation of uterine contractions following ruptured membranes in 13.4% and augmentation in active phase labour in 36.4% of the parturient women. Following the use of oxytocin, 76% of the women achieved vaginal delivery while 24% had emergency Caesarean section. There were no significant predictors of vaginal delivery among women who were exposed to oxytocin.

IOL rate of 11.5% was reported in a previous study, with 79.5% achieving vaginal delivery.8 IOL is commonly practised in obstetrics and is known to have benefits in well selected women. About 36% of women who were already in spontaneous active phase labour had augmentation of labour. This is the treatment of choice when slow labour progress is due to inadequate uterine contractions. Induction of labour increased the odds for vaginal delivery by 1.7-fold, stimulation of labour among women with ruptured membranes increased the odds for vaginal delivery by 1.4-fold while augmentation of labour had 4.9% decreased odds for vaginal delivery. In a related study but with different observations, 37% of their women had augmentation of labour with oxytocin and this was associated with a reduced Caesarean section risk.2

There is no universally acceptable pattern for oxytocin use. There is no agreement with regards to what should be the maximum dose and duration of use. Low and high dose oxytocin regimens among women have been described. In this study, the maximum dose of oxytocin was 32mU/min and this was required in 30% of the women. Only 3.9% of the parturient were exposed to oxytocin for more than 12 hours while about 68.7% delivered within 8 hours of commencement of oxytocin. In a related study, the use of high dose oxytocin for augmentation of labour resulted in considerable decrease in first stage of labour.9 This was not the case in another study where high dose oxytocin did not have any advantage compared to low dose oxytocin.10 A previous review comprising of data from 12 countries documented different regimens. Starting rates varied from 0.06 – 0.90IU/hour with a maximum dose rate of 0.9 – 3.6 IU/hour.11 In another study, regimens starting with 2mU/min and 4mU/min reduced the duration of first stage by 0.8 hours and 1.3 hours respectively.12

Most of the women had live births with good APGAR scores. Oxytocin therapy did not appear to affect fetal outcome negatively. The rare incidence of uterine hyperstimulation in this study may have accounted for this good fetal outcome. Uterine rupture was also not recorded in this study. Following uterine rupture, fetal morbidity and mortality increase rapidly. With good monitoring of women in labour, there is reduced risk of uterine hyperstimulation and rupture. Similarly, labour augmentation in a related study did not result in any adverse maternofoetal outcome.9 A lower dose of oxytocin helps to reduce the prevalence of tachysystole and foetal distress.10 Identification of optimal oxytocin infusion regimen for induction and augmentation of labour is therefore important to determine the effective dose devoid of maternofoetal adverse outcomes. In another study, oxytocin regimen did not affect Caesarean section rate or other perinatal outcome.12 However, some authors have found adverse fetal outcomes following maternal exposure to oxytocin.13

In the present study, there were no significant predictors of vaginal delivery among women who were exposed to oxytocin. Only maximum dose of oxytocin came close to the level of significance. However, the clinical relevance of this observation merits further evaluation, considering the potential for influencing the outcome of labour depending on the dose regimen applied. Further analysis of our data showed that previous vaginal delivery increased the odds for another vaginal delivery in index pregnancy by 11%, and spontaneous onset of labour increased the odds of vaginal delivery 13.5-fold. Similarly, we found that induction of labour increased the odds of vaginal delivery 1.7-fold, stimulation of labour increased the odds of vaginal delivery 1.4-fold while augmentation of labour had 4.9% decreased odds of vaginal delivery.

In a previous study, parity and the state of the cervix were the main predictors of successful labour induction.14 In another study, factors associated with vaginal delivery were maternal body mass index, fetal head engagement and fetal birth weight.15 In addition, a similar study reported that parturient women with spontaneous labour, who were booked for antenatal care, or experienced early fetal head engagement, were more likely to have a successful vaginal delivery.16 An earlier study published by Orhue17 in 1984 on the outcome of induced labour focused on the impact of maternal age, parity and preinduction state of the cervix on the outcome of IOL, but kept the role of oxytocin titration constant. In the present study, it seemed plausible to conclude that the lack of significant predictors of vaginal delivery was due to the overwhelming influence of oxytocin therapy on the roles of the limited number of independent predictors examined.

This study has shown that oxytocin therapy in labour can increase the proportion of women who may achieve vaginal delivery, without increasing adverse maternal or perinatal outcome. The initiating dose, duration of use, and the maximum dose attained have shown various adaptability to the clinical setting. In future research, determining the factors influencing the response to oxytocin and establishing a deeper understanding into the mechanism of oxytocin action at the molecular and cellular levels, will open a vista of exploration that may provide further clarification on the preferred modality of oxytocin use in labour.

We concede to some of the drawbacks of retrospective designs and the limitations inherent in single hospital-based research, but the reliability of the information retrieved for this study was strengthened by our repository of data kept in the department for over 30 years in the form of quality assurance electronic databank. Furthermore, the immediately measurable outcomes of interest in the present study made it easy to establish temporality between oxytocin therapy and maternal and perinatal outcomes.

**Conclusion**

There is a good chance of successful vaginal delivery following exposure to oxytocin in carefully selected women. We did not find significant predictors of vaginal delivery following the use of oxytocin in our study population. With proper monitoring in labour, fetal and maternal complications are rare among women who are exposed to oxytocin.

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