Original Article

Obstetrics and Gynaecology Section

The Effect of Oxygen Inhalation Plus Oxytocin Compared with Oxytocin Only on Postpartum Haemorrhage: A Randomized Clinical Trial

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ABSTRACT

Introduction: Post Partum Haemorrhage (PPH) is the leading cause of maternal mortality across the world, mainly in the developing countries.

Aim: The present study was conducted with the aim to investigate effect of oxygen inhalation plus oxytocin compared with oxytocin only on PPH.

Materials and Methods: This study was a clinical trial which was performed in Shahid Mustafa Khomieni Teaching Hospital of Ilam (western Iran) from April 2012 to Nov 2013. One hundred and twenty pregnant women who were referred to delivery ward for normal vaginal delivery were selected with convenience sampling method and they were randomly assigned into two groups. For both groups management of the third stage of labour was done using 1000CC Ringer and 20 units of Oxytocin. In the intervention group, in addition to the routine administration, 8 liters of oxygen via face mask was used continuously until 2 hours after delivery. Blood loss was determined by regular weighing of the buttocks that were previously weighted. The difference was calculated before and after weighing (1 gram increasing of weight was considered to be equivalent to 1CC blood loss). Data were analysed by SPSS 16 version using Student- t and Chi-square tests.

Results: The two groups were homogenous in regard to all the base line variables. The study results indicated that the mean of blood loss were (256.16±97) ml at two hours after delivery in the control group and (149.5±46.49) ml in the intervention group. There was a significant difference between PPH of the two groups ($p<0.006$).

Conclusion: Research findings showed that the use of inspired oxygen during the third stage of labour and oxytocin infusion during 2hours later resulted in a significant decreasing in the amount of bleeding after normal vaginal delivery.

Keywords: Oxygen inhalation therapy, Post partum period, Post-partum vaginal bledding, Third stage of labour, Vaginal blood loss

INTRODUCTION

Post Partum Haemorrhage (PPH) is a leading cause of maternal death worldwide, it is responsible for 30% of all direct maternal deaths that occurred in 1-5% of pregnancies in developed and developing countries [1,2]. PPH is defined as: blood loss ≥500cc and ≥1000cc after vaginal delivery and cesarean section, respectively [2]. Although 50% of all patients placed in this definition and their blood loss was ≥500cc, but we can estimate only half of blood loss [3]. Severe PPH is determined by decreasing of haematocrit (10%) and need for blood transfusion in post delivery period, i.e. severe bleeding occurred in 4% vaginal labour and 6% of cesarean section [4]. It is estimated that in worldwide 500,000 maternal deaths occurred, of these approximately one forth is caused by PPH [5]. The four main causes of PPH are uterine atony, labour canal laceration, coaglupathy and abnormal adhesion of placenta [2]. The most common cause of PPH is uterine atony, so prevention and treatment atony is the best intervention [6]. Now-a-days, some method performed for PPH including drugs that enforce uterine contractions such as Oxcytocin, Carboproset. Many complication for PPH patients occurs if oxcytocin is administered as intravenous which include (hypotension) tachycardia, low perfusion of coronary arteries, cardiac arrest and high doses, but slow infusion of oxcytocin also have complications such as convulsion due to hyponatraemia and antiduieretics effect [7,8], so there is need for safer administration of oxcytocin. Literature showed that hypoxia is one of the leading cause of uterine atony [7] and increasing of supply O_2 to myometer through O_2 inhalation could be effective contractions and resulted in prevention of bleeding [9] Ramsey et al., reported a cause of CO poisoning that O_2 therapy was resulted in resolution of bleeding and improved mental status [10] also women who experienced dyspnea after cesarean section and uterine atony following it approved this notion that O_2 therapy can improve contraction and prevented bleeding [9]. In this case many clinical trials have been performed that showed paradox results [10-12].

Yatawatta et al., in Srilanka, studied the effect of oxygen inhalation immediately after normal delivery on blood loss and concluded that the oxygen inhalation at 3rd stage stage of labor appear to reduce blood loss.

Considering safe delivery and importance of PPH in controlling mother and her child's life and paradox studies, the present study was conducted to evaluate the effect of O_2 inhalation plus oxytocin compared with oxytocin only on PPH.

MATERIALS AND METHODS

This study was a clinical trial for which the researchers, after receiving a written verification from Ilam (western Iran), Medical University Ethics Committee, as well as a written permission signed by Head of Research Deputy and Head of Treatment Deputy of Ilam University of Medical Sciences, referred to Shahid Mostafa Khomeini (PBUH) Hospital of Ilam and besides observing Helsinki & Belmont statements, studied 120 women who had eligible criteria and were referred between April 2012 to Nov 2013. It should be noted that we calculated the sample size based on the following formula:

$$n=\frac{(Z1-\alpha/2+Z1-\beta)^2*(s_1^2+s_2^2)}{(\mu_1-\mu_2)^2}=\frac{(1.25+1.96)^2*((16.9)^2+(32.4)^2)}{(34.1-19.1)^2}=59$$

Considering the sample size the inclusion and exclusion criteria 120 eligible women were included. There was no dropout after randomization and the data of 120 women were available for analysis. Written consent form was signed by all the sutdy subjects. The inclusion criteria were: 18-35years age group, single-delivery, alive fetus, fetus weight 2500-4000 gram and vaginal delivery. We excluded women who had blood pressure >140/90, placenta previa, placenta abortion, history of bleeding during pregnancy, curettage, cesarean section or uterine scar, PPH, polyhydraminos, uterine anomaly, immunity impairment, instrumental delivery, HB<8g/dl, anticoagulant drugs consumption, prolongation of first stage of labour greater than 15 hours, rapid delivery (less than 3 hours), as well as multiparity.

The cases were randomly divided into two groups of 60 women and both of them received 1000CC Ringer lactate serum and 20 IU Oxytocin for management of third stage of labour. Participants who assigned in intervention group received 8 liters O_2 through face mask from fetus delivery to 2 hours later, control group inhaled room air. Then O_2 saturation was measured by pulse oxymeter device, blood loss determined by weighting of gauzes.

In both of groups blood pressure, temperature, pulse & respiratory rate were measured and recorded each quarter and each half-hour during 1 and 2 hours after delivery, respectively [Table/Fig-1]. Also, frequency of lactation and its duration by determining sucking by neonate were recorded. PPH were calculated by weighting of used gauzes and Shaun by digital SECA model paediatric balance. Randomization was performed by first pick up of the participant name then the participants were selected as sequential. The data were collected by interview, observations as well as digital balance (sensitivity= 1 gr). The clinical trial registration code is IRCT2012102411253N1.

STATISTICAL ANALYSIS

Validity and reliability were measured through content and pearson correlation coefficient (r=0.92) besides the balance were checked daily by 500 grams calibration weights. The observed data were analysed using SPSS, version 16 Software using Student-t and Chi-square tests.

RESULTS

The study and the control groups were similar in age, parity, gestational age, first and second stages of labour, lactation period and frequency, fetus gender and weight, education and job status of mother, wanted or unwanted pregnancy, induction rates, episiotomy rate as well as spontaneous lacerations [Table/Fig-2].

The study results indicated that the mean of blood loss were (256.16±97) ml at the two hours after delivery in the control group and (149.5±46.49) ml in the intervention group with p=0.006, the difference was statistically significant [Table/Fig-3].

DISCUSSION

The amount of bleeding which occurred in first hour after delivery and uterine atony is the most common cause [12]. In many studies hypoxia was an important factor in aetiology of uterine atony [7]. Till now three studies have performed about effect of O_2 therapy on PPH [10-12]. The finding of present study is similar with other studies.

Yatawatta et al., evaluated the effect of oxygen inhalation on blood loss among 60 women with normal vaginal delivery [9]. The results of study demonstrated that mean vaginal blood loss during the 1st hour was lower in oxygen group as compared with control group (16.9±19.1mL vs 32.4±34.1mL). This difference was statistically significant (p=0.05). In another study the mean vaginal blood loss 2 hours postpartum was 27.7 ± 5.8 ml in O_2 inhalation group and 48.8± 8.4 ml in the controls (p < 0.05) [13].

Above mentioned studies [9,13] showed that PPH in O_2 therapy patients is lower than control group and blood loss reduction in these studies is the role of oxygen on improvement of uterine contractions. In present study, we achieved similar findings.

However, in contrast with our finding Güngördük et al., conducted a clinical trial in Istanbul, which aimed to evaluate the role of O_2 therapy on PPH. Based on their results, the blood loss during third and fourth stages of labour had no significant differences between the control and oxygen-inhalation groups (294.5 ± 179.7 vs 273.4 ± 146.6 mL, respectively) [11]. It is concluded that these differences between above mentioned study and other study may be due to confounding variables such as bleeding due to canal lacerations, genetics, difference in time of O_2 consumption, O_2 concentration and various sample sizes.

In case of O_2 mechanism on PPH reduction, it has been hypothesized that increasing of supply to myometer through

Variable	Intervention Group		Control Group	p-value
Age (year)	Mean+SD	27.68±5.4	29.5±4.8	0.57
Weight (gr)	Mean+SD	3200±258	3300±285	0.06
Gravidity rate	Mean+SD	1.78±0.8	1.80±0.8	0.91
Lactation frequency	Mean+SD	1.88±0.7	1.78±0.8	0.46
Lactation duration	Mean+SD	25.7±10	24.2±10	0.43
Educational level	Preliminary	13(21.7%)	10(16.7%)	0. 67
	Guidance school	11(18.3%)	16(26.7%)	
	High school	27(45%)	25(41.7%)	
	Higher education	9(15%)	9(15%)	
Location of residence	City	44(47.3%)	49(52.7%)	0.27
	Village	16(26.7%)	11(18.3%)	
Job status	Employee	12(20%)	11(18.3%)	0.81
	House keeper	48(80%)	49(81.3%)	
Race	Kurd	47(78.3%)	50(83.3%)	0.44
	Non-Kurd	13(21.7%)	10(16.7%)	
Neonate sex	Boy	35(58.3%)	29(48.3%)	0.27
	Girl	25(41.7%)	31(51.7%)	
Pregnancy status	Wanted	52(86.4%)	49(81.7%)	0.35
	Unwanted	8(13.6%)	11(18.3%)	

[Table/Fig-2]: Comparison baseline variables in two groups.

	Intervention Group	Control Group	p-value
First hour	101.55±37.15	171.76±77.43	0.002
Second hour	47.53±17.6	80.41±35.7	0.001
Total	149.5±46.49	256.16±97.25	0.006

[Table/Fig-3]: Comparison Mean+SD of PPH in two groups during 2 hours after delivery.

Vital Signs	Intervention Group			Control Group			p-value		
	Before Intervention	First hour	Second hour	Before Intervention	First hour	Second hour	Before Intervention	First hour	Second hour
BP (Systolic)	118.3±7.4	111.3±9.2	110.2±6.7	115.7±7.3	112.1±8.0	113.4.±8.8	0.65	0.62	0.45
BP (Diastolic)	74.2±1.4	71.39±8.1	67.3±7.3	75±2.3	70.7±9.9	69.6±9.4	0.52	0.93	0.56
PR	81.1±2.1	82.4±3.4	71.1±1.4	80.5±2.2	83.5±4.2	79±5.9	0.27	0.15	0.00
RR	19.1±0.58	18.4±0.45	17±0.46	19±0.67	19±0.2	18.5±0.37	0.13	0.59	0.00
T	37±0.11	37.1±1.8	37±2.1	36.9±0.15	37.2±2.1	37±2.3	0.55	0.57	0.55

[Table/Fig-1]: Comparison Mean ± SD of V/S in two groups during first and second hours after delivery.

O_2 inhalation by mother could be caused to uterine muscles contraction and decreasing blood loss [10].

Also, based on oxy-haemoglobin dissociation curve, when we inhalate air of room PaO_2 is 100 mmHg and when we inhalate O_2 (40%) by mask, it is anticipated that the PaO_2>200 mmHg, this resulted in 2 fold increasing of PaO_2 in O_2 inhaled group, increasing PaO_2 maybe by increasing contraction of myometer muscles caused to reduction in bleeding, besides, it cause to increasing of muscle tone in vascular system and finally decreasing of bleeding [9].

Seidy et al., performed study with the aim to assess the effectiveness of supplementary O_2 therapy on severity of nausea and vomiting after cesarean section, they concluded that increasing of O_2 caused to serum dopamine reduction, that dopamine through excitation of post synaptic of Dopamin-1 in smooth muscles vessel caused to vasodilatation [14], also this is a probable causes of effectiveness of O_2 on blood loss reduction.

In this study, the oxygen that is a safe, nontoxic, inexpensive and available drug, in short term has no side effects, and was seen as an utero-tonic agent.

LIMITATION

The limitations of this study were relatively small sample size and was not blinded. We suggest studies with large sample sizes, also in addition to study the effect of O_2 on prevention of atony after cesarean delivery.

CONCLUSION

Based on the research finding, we concluded that use of O_2 through inhalation immediately after fetus delivery and during third and forth stages of labour with oxytocin infusion helps in reduction of bleeding after delivery. It is effective, safe and inexpensive method that also decreases other utero -tonic drugs consumption for controlling PPH.

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