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Original Article

Obstetrics and Gynaecology Section

Comparing the Effect of Dextrose and Oxytocin to Reduce Postpartum Haemorrhage: Randomised Controlled Trial

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ABSTRACT

Introduction: Post-partum haemorrhage is a leading cause of maternal mortality and morbidity worldwide. There are different management procedures adopted for the treatment of post-partum haemorrhage.

Aim: To evaluate the efficacy of dextrose in Post-partum Haemorrhage (PPH) and compare it with Oxytocin (a conventional method).

Materials and Methods: A two-arm randomised controlled trial was conducted among 120 pregnant women admitted to the delivery room of the Obstetric and Gynaecological Unit of a Teaching Hospital. Participants were randomised to receive either 20 unit of oxytocin in 1000 mL ringer lactate solution (routine administration, control group) or 200 mL of 10% dextrose solution (intervention group). The primary outcome measured in this study was amount of blood loss. The outcome was assessed at 1 hour and 2 hours. Data were analysed using SPSS version 22.0, chi-square and student's t-tests. Authors used expected maximisation to handle missing data to enable an intention-to-treat analysis.

Results: At baseline, the groups were homogeneous in regards to socio-demographic variables. The average blood loss was significantly lower in the intervention group (dextrose 10%) compared to the control group (oxytocin) ($p<0.05$).

Conclusion: Administering of dextrose 10% to pregnant women at the third stage of labour was associated with lower post-partum haemorrhage than oxytocin.

Keywords: Blood loss, Oxytocin, Vaginal delivery

INTRODUCTION

Post-Partum Haemorrhage (PPH) is the third cause of maternal mortality and accounts for the majority of the 14 million cases annually [1]. PPH is defined as the loss of ≥500 mL of blood (or 1000 mL) in the first 24 hours after delivery. The global prevalence of PPH ranged from 7.2% in Oceania to 25.7% in Africa. The prevalence of PPH in Iran is 4% [2,3]. The most common cause of PPH is failure of uterine contraction (uterine atony) following delivery. There are several known factors that cause uterine atony including prolonged labour, excessive enlargement of the uterus, multi-fetal pregnancy and multiparity. The first-line treatment for PPH is administration of Oxytocin, Carboprost, Tromethamine and Metyl Orgonat. Oxytocin (20 IU in 1000 mL ringer lactate solution) is infused for 1 hour after delivery in order to retain the normal uteral tone [4-6]. However, these drugs have several side-effects. For example, common side-effects of oxytocin include: hypertension, tachycardia, reduced myocardial perfusion, cardiac arrest and water intoxication [7]. Other common adverse-effect of oxytocin include water retention and seizure secondary to hyponatremia [8]. As mentioned earlier, many of the currently marketed drugs have several side-effects and limitation, which makes it necessary to study alternatives to these drugs. There is evidence of the influential effects of glucose (dextrose) on smooth muscle cells [9]. Glycogen serves as the most important source of energy for the muscle contractions (glycogen is the storage form of glucose). Maternal stress leads to muscle cells contraction and potentially cause glucose uptake [3]. These contractions act as a fatigue factor on the myometrium muscles and thus lead to postpartum atony. A low level of glucose will lead to low level of insulin. Consequently, the body will produce ketones to fuel the body cells. A build-up of ketones in the blood can lead to ketoacidosis which can effectively decrease the frequency and intensity of uterine contractions. This can be prevented and managed by giving intravenous injection of glucose [3]. Recent data suggest that injection of dextrose 10% can effectively stimulate uterine contraction after caesarean section [9]. The vaginal delivery is the optimal method of childbirth [10,11]. Researchers should try to identify safe techniques to follow in order to reduce labour complications rate. Thus, the present study aimed to compare the effect of dextrose 10% and oxytocin on PPH after the delivery.

MATERIALS AND METHODS

Study Design

1. A two-armed randomised trial over 11 months (from April 2012 till February 2013) was conducted. Participants were randomised into the two groups.
2. Receiving 20 unit of oxytocin in 1000 mL ringer lactate solution (routine administration, control group).
3. Receiving 200 mL of 10% dextrose solution (intervention group).

Study Setting

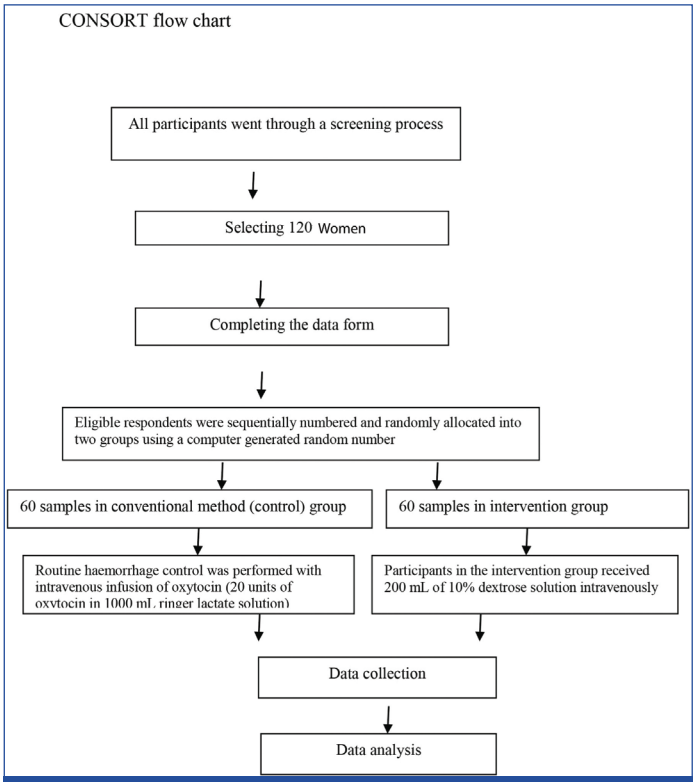
Participants were recruited from an urban primary and secondary hospital in Ilam city, Iran. All pregnant women who were admitted to labour room for delivery during the study period were invited to participate in this study. Participants were eligible if they were in the third phase of vaginal delivery, singleton pregnancies, aged 18-35 years-old, and fetus weight of 2500-4500 grams. Participants were excluded if they had hypertension, placenta previa, placental abruption, anemia (haemoglobin <12 g/mL), the first stages of delivery lasted more than 15 hours, polyhydramnios, multiple pregnancy, past or present history of vaginal bleeding during pregnancy and delivery, curettage, cesarean section, operative vaginal delivery and history of anticoagulant therapy.

Determination of Sample Size

Sample size was estimated at the desired significance level of 5%, two-sided alpha of 0.05 and 90% power to detect a 3 mL difference in blood loss. Primary outcome was amount of PPH. The sample was calculated based on the amount of blood loss differences between two groups. Hence, sample size calculations show that at least 60 subjects in each group were needed to detect a statistical difference.

Recruitment and Randomisation Process

The recruitment process was conducted in two stages. At the first stage, to achieve adequate participant enrolment, advertising flyers were placed on the notice boards of the hospital. In the second stage, all participants went through a screening process conducted by the researchers. Based on the inclusion and exclusion criteria 120 patients were screened for eligibility by the study researchers. The screening process was standardised with a comprehensive case report form, on which each respondent's results were recorded. The information collected included socio-demographic profiles, medical and drug history and amount of bleeding. Prior to enrolment, eligible participants were provided with a detailed description of the study. Following examination and enrolment, eligible respondents were sequentially numbered and randomly allocated into two groups using a computer generated random number. The person (the first author) conducting the randomisation, received only participants IDs and was hence completely blind to the respondent's information and identities [Table/Fig-1].



[Table/Fig-1]: CONSORT flow chart.

The Intervention

Immediately after the delivery, routine haemorrhage control was performed with intravenous infusion of oxytocin (20 units of oxytocin in 1000 mL ringer lactate solution) in control group. Participants in the intervention group received 200 mL of 10% dextrose solution intravenously to prevent any potential PPH. For each patient, systolic and diastolic blood pressure, body temperature, pulse and respiratory rate were continuously measured and recorded each quarter during the first 48 hours after delivery. The volume of blood loss was calculated by subtracting the weight of gauzes placed under the patient's buttocks before delivery from the weight of the Shawn after all visible blood were wiped away. Gauze samples were weighed and recorded at first and second hour after delivery. One-gram increase in the weight of the gauzes is equal to one millilitre of blood loss. Gauze samples were weighted by a digital sensitive weighing balance (Scoute, Ohaus, 0.1 g accuracy) [6,12-15].

Ethical Consideration

The Ilam University of Medical Science approved this study. All eligible participants were provided with oral and written informed consent prior to initiation of the study and were asked to sign consent form.

Trial Registry

This trial was registered in the world health organisation approved Committee of the Iranian Clinical Trial Registry with registration number IRCT201304146790N6.

STATISTICAL ANALYSIS

Descriptive statistics were presented using frequencies for categorical data and means and Standard Deviation (SD) for continuous variables. The normality of the data was assessed using Shapiro-Wilk tests. Baseline characteristics of the two groups (Homogeneity of sample) were assessed using analysis of variance for continuous variables and chi-square statistics for categorical variables. Chi-square and independent t-test were used to determine the effect of the intervention within the groups during the study period (one and two hours after delivery). All data were analysed using SPSS, (version 16, SPSS Inc, Chicago, IL, USA).

RESULTS

As shown in [Table/Fig-2], the two groups had similar characteristics at baseline. Further, the mean differences for each covariate between two groups were not statistically significant. Two independent sample t-tests were conducted to compare the effect of administering oxytocin and Dextrose 10% on the amount of PPH after delivery. The first sample t-test indicated that there was a significant difference in the scores of dextrose 10% (142.17±61.15) and oxytocin (196.27±56.24) on the amount of PPH one hour after delivery (p=0.001). The second sample t-test indicated that there was a significant difference in the score of dextrose 10% (81.65±15.45) and oxytocin (102.65±13.32) on the amount of PPH two hours after delivery (p=0.002) [Table/Fig-3]. As shown in this study, dextrose 10% was more effective in controlling PPH as compared to oxytocin during the first and second hours after delivery.

Groups/Variable	Oxytocin Mean±SD	Dextrose Mean±SD	p-value
Mothers age	29.15±4.13	28.64±4.09	0.62
BMI	23.82±1.3	24.55±2.3	0.56
Gestational age (week)	38.89±1.1	39.45±0.9	0.48
Gravity (number)	1.82±0.7	1.76±0.5	0.53
Term of active phase (minute)	251.71±53.7	260.27±43.3	0.53
Second stage period (minute)	51.79±8.62	59.45±7.51	0.087
The time of lactation starting *(minute)	28.25±5.8	32.15±4.8	0.21
Neonate weigh (gram)	3200±330	3250±219	0.32
APGAR	8.98±0.08	9.15±0.02	0.55

[Table/Fig-2]: Comparison of demographic data, midwifery factor and neonatal factor in two groups.
*time between childbirth and beginning of breastfeeding

Bleeding (CC)/Time	Oxytocin Mean±SD	Dextrose Mean±SD	p-value
The amount of bleeding (first hour) (mL)	196.27±56.24	142.17±61.15	0.001
The amount of bleeding (second hour) (mL)	102.65±13.32	81.65±15.45	0.002

[Table/Fig-3]: Mean±SD of Blood loss during two hours after delivery in two groups.

DISCUSSION

PPH is considered as one of the most important factor contributed to maternal mortality and life-threatening situation in developing countries [16]. Uterine atony is the most common cause of PPH, accounting for 80% of PPH cases. To prevent PPH due to ineffective uterine contractions, effective strategies to prevent and manage bleeding, need be applied. The present study indicated that the intravenous administration of dextrose 10% is an appropriate strategy for controlling PPH. Dextrose is more effective than oxytocin in controlling blood loss during the two hours after delivery. This result is in line with the findings of the previous study by Rafiee MS et al., [9]. Previous studies have compared the effectiveness of date fruit consumption and oxytocin on the amount of bleeding following normal delivery. Results of these studies suggested that blood loss during the first two hours after delivery were lower in those participants who received date fruit when compared to those who received oxytocin ($p<0.005$) [8,9]. Hatami Rad R NS and Hekmat KH, compared the effectiveness of Normal saline and Dextrose saline on Labour period and delivery outcomes in nulliparous women. The finding from this study indicated that duration of labour can be decreased by the administration of intravenous dextrose [11]. Rahmani Bilandi R MA et al., conducted a clinical study to examine the effectiveness of food intake during labour on obstetric outcomes. Participants were divided into two groups: consumption of a light diet or water during labour. This study indicates that the duration of labour was shorter in those who consume a light diet [17]. With regard to the effect of dextrose 10% on postpartum haemorrhage, it was hypothesised that activation of voltage-gated calcium (Ca^{2+}) channels initiate contraction of myometer directly by increasing cytosolic Ca^{2+} concentration. In particular, the role of potassium channels must not be ignored. Potassium channels have inhibitory effect on calcium L-type channels [9].

There is some evidence that shows that acute hyperglycaemia cause vasodilatation by increasing opening of potassium channels and Protein Kinase C (PKC) [9,18-20].

LIMITATION

Because of ethical consideration, we could not deprive one group from intervention and compare intervention groups with control (no intervention) group.

CONCLUSION

Administering of dextrose 10% to pregnant women at the third stage of labour is associated with lower postpartum haemorrhage compared to Oxytocin.

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Author's Contribution: MA, HT, ZS, GA were responsible for the study conception, design, literature review, data analysis, and manuscript preparation.

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