

Normal Saline and Dextrose-Saline Infusion Comparison in the Duration of Active Phase in Nulliparous Women

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Abstract

Background: During labor, it is not unusual for women to have little or no nutrient intake, in spite of the fact that the demand for energy increases as a result of skeletal and smooth muscle contractions.

Objectives: The objective of the study was to compare the effects of intravenous normal saline with dextrose-saline on the duration of active phase in nulliparous women.

Patients and Methods: In this randomized clinical trial, 174 nulliparous women with gestational age of ≥ 36 weeks in the active phase of spontaneous labor were divided into two groups, receiving either normal saline (NS) or dextrose 5% in normal saline (D5NS) with a rate of 120 mL/hour. The primary outcome was the duration of active phase of labor in vaginally-delivered subjects. The secondary outcomes were the duration of second stage of labor, need to oxytocin, and neonate Apgar score. Data were analyzed with t-test and chi-squared test.

Results: Of 174 objects enrolled, 150 women delivered vaginally and completed the study. There was a significant difference in the duration of active phase between the groups (NS: 270.20 ± 13.37 minutes; D5NS: 206.67 ± 11.72 minutes) ($P < 0.001$) and second stage of labor (NS: 45.20 ± 1.65 minutes; D5NS: 37.27 ± 1.73 minutes) ($P < 0.001$). No significant difference was observed in the need to oxytocin as well as in Apgar score between the groups.

Conclusions: The administration of dextrose saline was associated with a shortened active phase and second stage of labor in vaginally delivered nulliparous women.

Keywords: Dextrose, Hydration, Labor, Nulliparity

1. Background

During labor, it is common for women to have little or no nutrient intake, in spite of the fact that the demand of energy increases as a result of skeletal and smooth muscle contractions (1). Myometrial contractility is one of the multiple factors affecting the progress of labor (2). As adequate hydration improves the muscle performance in prolonged exercise and labor can be considered as a prolonged exercise, adequate fluid administration may improve the labor progress (3, 4). Glucose is the main substrate for pregnant uterus. Adequate resource of glucose is needed to maintain exercise tolerance and muscle efficiency, because these are important factors in the progress of human labor and parturition. Therefore, it can be postulated that dysfunctional or prolonged labor procedure, a leading indication for primary cesarean delivery, could at least in part be raised from inadequate uterine forces or inappropriate coordinated contractions because of inadequate availability of the substrate (5, 6). Garite et al. demonstrated that by increasing the rate of maternal hydration, a reduction in frequency of pro-

longed labor could be achieved, and possibly there will be lesser need for oxytocin and cesarean delivery (7). Eslamian et al. (8) confirmed the effect of increased parenteral hydration on decreasing the duration of labor, which was followed by Shrivastava et al. (9), when they demonstrated that parenteral administration of dextrose solution was associated with shortened labor course in term vaginally delivered nulliparous women in spontaneous labor. Handa et al established that the physiological requirement for a laboring uterus was approximately 10 g of carbohydrates per hour (10). Dapuzzo-Argiriou et al. demonstrated that the use of intravenous fluid containing 5% dextrose did not lower the chance of cesarean delivery for women admitted in active labor (11). Fong et al. demonstrated that neither rate of delivery nor dextrose administration in intravenous fluids altered the labor length or delivery outcomes in nulliparous women who were present in active labor (12). Pregnant women in the active phase of labor often have restricted oral caloric intake because of diminished desire as well as concerns for

gastric aspiration if cesarean is deemed necessary. Sufficient hydration results in improvement of muscular activity and since labor progress is considered a prolonged exercise, it seems that adequate hydration may accelerate the labor phase.

2. Objectives

The present study was aimed to evaluate the effect of intravenous dextrose-saline compared with intravenous normal saline in nulliparous women who were in the active phase of spontaneous labor.

3. Patients and Methods

This prospective randomized controlled trial, after the approval of the Ethics Committee of Qazvin University of Medical Sciences (IRCT201209253025N3), was carried out in the labor ward, department of obstetrics and gynecology, Kowsar hospital, Qazvin university of medical sciences, in 2013. One hundred and seventy four pregnant nulliparous women with singleton pregnancies were included in the study in the active phase of spontaneous labor (cervical dilatation 3 - 5 cm), with or without ruptured membranes on week 36 or longer gestation age with cephalic presentation. Women with diabetes mellitus, pre-eclampsia, cardiac or renal disease, symptom of chorioamnionitis or fetal distress, pyrexia, intrauterine fetal death, meconium, and need to emergency cesarean section in labor process were excluded. Once informed consents were obtained, the women were randomly assigned into two groups. All the participants were unaware of the nature of the fluid given, as the stickers on the fluid bottles were removed by the nursing staff. Each woman had vaginal examination every 1 hour; artificial rupture of membranes was done at 5 cm cervical dilatation; if any woman had existed leakage, immediate vaginal examination would be performed to rule out cord prolapse and her cervical findings at the time of membrane rupture were noted. The case group was provided with dextrose-saline solution and the control group was given normal saline alone. Fluid was administered in all the cases by infusion pumps at a rate of 120 mL/hour and the women did not consume anything by mouth. The case group received dextrose-saline at a rate of 120 mL/hour and this procedure was repeated up to the delivery of neonate. The second group received normal saline (0.9%) at a rate of 120 mL/hour. The initial examination was recorded as well as the serum initiation time. Next, hourly examination was conducted and the parturition procedure was controlled. For a dilatation progress lower than 1.2 cm/hour, uterine contractions were controlled and oxytocin was administered in case of insufficiency. Oxytocin in 10 IU/L of solution with an initial rate of five drops per minute was administered to enhance uterine contractions. The patient would be prepared for cesarean section in case of no change in dilatation for two hours and no descend for one hour. In normal rate parturition

and accomplishment of dilatation, its time as well as fetus outcome time and Apgar score subsequent to labor were recorded. The primary outcome was the duration of labor in active phase. Secondary outcomes were the duration of second phase of labor, need to oxytocin administration, and the neonatal outcome included Apgar score (one and five minutes). The employed software in this study was SPSS (version 20). Data were analyzed with chi-squared and t-test. P value < 0.05 was considered significant.

4. Results

One hundred and seventy four pregnant nulliparous women admitted in spontaneous labor were included in the study. Fourteen individuals in the control group (four women for arrest in dilatation and one for arrest in descend, three for non-reassuring fetal heart rate and six for meconium) and 10 in the case group (two for arrest in dilatation, four for non-reassuring fetal heart rate, and four for meconium) had cesarean section and were excluded from the study, as the emergency cesarean was performed at different cervical dilatations and this could not be accounted for the estimation of duration of labor (Figure 1).

The demographic characteristics were similar in both groups (Table 1). The mean duration of active phase of labor in the case group was 206.67 ± 11.72 minutes and in the control group it was 270.20 ± 13.37 minutes ($P < 0.001$). Likewise, the mean time of the second phase in the case group was 37.27 ± 1.73 minutes and that of the control group was 45.20 ± 1.65 minutes, which showed a significant difference ($P < 0.001$) (Table 2). Five (6.7%) women in the case group and 11 (14.7%) in the control group required the use of oxytocin and this difference was not statistically significant ($P = 0.1$).

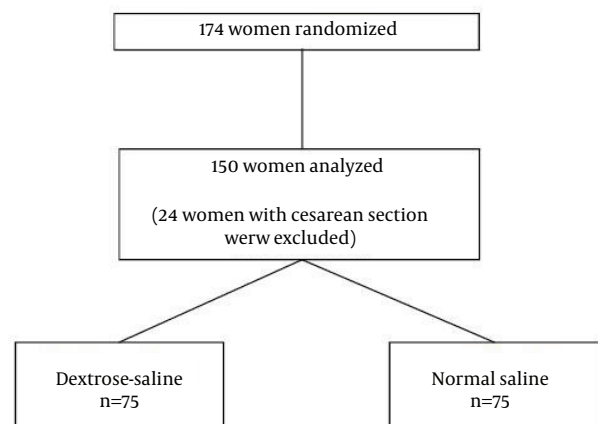


Figure 1. Participation Flowchart

Table 1. Demographic Characteristics in Case and Control Groups

Index Group	Case ^a	Control ^a	T ^b	P Value
Gestation age, d	274.32 ± 0.83	273.45 ± 0.89	0.710	0.4
Mother's age, y	24.44 ± 0.56	23.25 ± 0.47	1.618	0.1

^aValues are presented as mean ± SD.^bIndependent samples test.**Table 2.** Comparison of Mean of Active Phase and Labor Second Phase Courses in Case and Control Groups

Index Group	Case ^a	Control ^a	T ^b	P Value
Active phase course, min	206.67 ± 11.72	270.20 ± 13.37	3.574	< 0.001
Second phase course, min	37.27 ± 1.73	45.20 ± 1.64	3.320	< 0.001

^aValues are presented as mean ± SD.^bIndependent samples test.

The mean Apgar score of one minute was 0.9 ± 0.003 in the case group and 0.9 ± 0.003 in the control group; so, there was no difference between two groups ($P > 0.05$). The mean Apgar score of five minutes was 0.9 ± 0.003 in the case group and 0.9 ± 0.002 in the control group; there was no difference between two groups ($P > 0.05$).

5. Discussion

In this study, we observed that dextrose-saline solution alternating with normal saline solution was associated with significant reduction in the duration of labor. It led to significant attenuation in active labor phase course as well as detraction in labor second phase ($P < 0.001$). However, it brought about no significant difference in the need for administration of oxytocin as well as neonatal Apgar score. The observed reduction in the active phase duration and in the second stage of labor in vaginally delivered subjects was at minimums of 64 minutes and 8 minutes, respectively, in the dextrose-saline group compared with the normal saline alone ($P < 0.001$). In a study by Sharma, 250 nulliparous pregnant women who had singleton term pregnancies and were in labor active phase were included in a study. One group received normal saline with 175 mL/hour rate and the other received the same amount for dextrose-saline in which the labor course was shortened in dextrose-saline group ($P = 0$) and prolonged labor was less likely to be seen ($P = 0.01$). No difference was seen in terms of the cesarean rate. The researchers concluded that the administration of dextrose-saline in nulliparous women who were in autonomic active labor phase was preferred to other infused fluids (13). Shrivastava et al. (9) performed a clinical trial on 289 pregnant women who were in their labor active phase. They randomly assigned the subjects into three groups. The first group received normal saline, the second normal saline with dextrose 5%, and the third normal saline with dextrose 10% with a 125 mL/hour rate. The results showed that dextrose-saline

administration regardless of its concentration led to a significant detraction of the labor total course as well as the labor second phase ($P = 0.01$); however, this difference was not significant in regards with the cesarean rate ($P = 0.21$) (9). Improvement in labor performance with decreased duration of labor, need for oxytocin, and lesser incidence of prolonged labor with the use of dextrose solution alternating with normal saline can be explained on the basis of the fact that the uterine muscle receives better nutrition as well as early removal of the toxic products of metabolism due to better hydration (3). Eslamian (8) showed the effects of two intravenous fluid therapy regimens in women with term labor. One group received normal saline in 125 mL/hour rate and the second received it in 250 mL/hour rate; the labor course was significantly shortened in the second group ($P = 0.0001$) and the taken oxytocin was lesser as well ($P = 0.001$). Although the rate of cesarean was minor in this group, it was not statistically significant ($P = 0.1$). The researchers concluded that higher administration of intravenous fluids in nulliparous women who were in their active phase brought about shortened labor course (8). In a randomized clinical trial, Hatami Rad (14) compared the effects of normal saline solution with dextrose-saline in 80 pregnant women who were in their active labor phase. The ultimate results showed that the duration of first and second labor phases in group who received dextrose-saline was significantly shortened ($P < 0.001$), which is consistent with the present study (14). In their study, the need of oxytocin was significantly attenuated ($P = 0.019$), which is different from our study. In the present study, 14.7% of mothers in the normal saline group and 6.7% in the dextrose-saline one were in the need of oxytocin at the time of labor, but the difference was not statistically significant ($P = 0.1$). This variation in the two studies could be raised from better bishop score in Hatami Rad's study (14) whose subjects had bishop scores above 7; therefore, their need for oxytocin was much lower. Fong et al. (12) performed

a research on effect of dextrose in the administered solution to pregnant mothers who were in their active labor phase with different rates and concentrations. First group received normal saline at 250 mL/hour, second one received dextrose 5% in normal saline solution as 125 mL/hour, and third one received dextrose 2.5% in normal saline solution as 250 mL/hour. The results of the study showed that there was no significant difference across the first labor phase course, second labor phase, and total labor course in the three groups. The final result was that dextrose administration may not affect the labor course or labor outcomes (12). The obtained results are not consistent with the present study. It might be due to higher number of subjects and different study method from our study; because all the groups received normal saline in same concentrations and their difference was the dextrose concentration and dose.

It is concluded from the present findings and other consistent studies that dextrose solution administration provides the required energy for pregnant mothers during the labor procedure through the detracting of harmful metabolites produced throughout the anaerobic cycle together with ATP production and may lead to acceleration of the labor process.

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Footnotes

Authors' Contribution: Farideh Movahed: study design; Laleh Jamsi: data collection; Ameneh Barikani: analysis of data and SPSS software application usage; Mina Ataee: academic writing; Hamideh Pakniat: manuscript submission.

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