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ORIGINAL ARTICLE

Drinking during low-risk labor: monocentric randomized clinical trial on patients' satisfaction, and maternal and neonatal outcomes

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ABSTRACT

Introduction: This study aimed to assess satisfaction of patients affected by various fluid regimes during uncomplicated labor; to identify factors possibly associated with the level of satisfaction; to compare obstetrical and neonatal outcomes between the intervention groups.

Methods: Between October and December 2014, 40 women were included in the study set at the Poitiers University Hospital, France. Women were randomly allocated to two study arms: 20 to strict and 20 to liberal fluid regime group. Women's satisfaction was assessed using visual analog scale. Categorical obstetrical and neonatal outcomes were analyzed using Chi-squared test and Fischer's exact test. The between-group difference was assessed with Mann–Whitney *U*-test.

Results: Overall satisfaction was higher among women from the liberal fluid regime than from the strict fluid regime group (median score: 88, interquartile range [IQR]: 21 vs. 72, IQR: 21; $p = 0.03$). The active phase of the second stage of labor was shorter in the liberal fluid regime than in the strict fluid regime group (median 9 min, IQR: 7 vs. 17 min, IQR: 12; $p = 0.02$). The length of stay in the delivery room was significantly shorter in liberal fluid regime than in strict fluid regime group (median 190 min, IQR: 128 vs. 340 min, IQR: 195, $p = 0.04$). There were no significant differences in other obstetrical and neonatal outcomes.

Conclusion: Liberal fluid regime during labor was associated with significantly higher satisfaction of women. The active phase of the second stage of labor and the length of stay in the delivery room were significantly shorter in the liberal fluid regime group.

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Drinking; labor; obstetrics; randomized controlled trial; patient satisfaction

Introduction

Feeding and fluid regimes during labor due to the risk of aspiration pneumonia [1] and anesthesia-related deaths are major controversies in obstetrics. These concepts are challenged by other studies demonstrating that withholding from food and fluids increases the production of hydrochloric acid, which can also be a cause of aspiration pneumonia [2].

Currently, both American College of Obstetricians and Gynecologists [3] and American Society of Anesthesiologists [4] recommend avoiding solid food during labor but allow for drinking modest amounts of clear liquids by mothers during uncomplicated labor. French National Authority for Health enforces similar recommendations [5]. Several other health-related organizations allow for eating and drinking as desired or tolerated during low-risk labor [6–9].

Despite the recommendations, restriction of liquids during labor is still frequently inappropriately practiced in many hospitals. A recent French survey reported that about 40% of women in labor could drink [10]. In an American survey, around 60% of mothers reported not drinking in labor [11].

Several studies have shown the benefits of fluid and/or food intake during labor [12,13]. However, up to now, far too little attention has been paid to maternal satisfaction [14]. Due to this paucity of evidence on maternal satisfaction, professional guidelines providers cannot factor it in their opinions.

The primary aim of this study was to assess the satisfaction of patients affected by various fluid regimes during uncomplicated labor. The secondary objective was to identify other factors possibly associated with the level of satisfaction and to compare obstetrical

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and neonatal outcomes depending on the strictness of the fluid regime.

Material and methods

Study design and population

We conducted a monocentric, non-blinded, randomized clinical trial at the Poitiers University Hospital, France. The hospital is a referral healthcare facility for the northern Nouvelle-Aquitaine region. The study was conducted for ten weeks between October and December 2014.

All women who met inclusion criteria and provided written informed consent were included in the study. The inclusion criteria encompassed: participants age >18 and <35 y; single pregnancy; gestational age between 37 and 41 weeks; cephalic presentation of a fetus; maternal body mass index (BMI) >17 and <40 kg/m^2; parity <4; spontaneous onset of labor; cervical dilatation <5 cm at the onset of the trial. The exclusion criteria were- any serious preexisting medical condition; history of cesarean section; any fetal complication; fetal anomalies arising from chromosomal disorders or congenital malformations; and fetal growth <10th percentile.

Participants were randomized to either a strict or liberal fluid regime using sequentially numbered opaque sealed envelopes technique at the time of the admission to the labor ward. The allocation ratio was 1:1. Blinding of study participants and healthcare providers was not possible and has not been implemented.

Hydration protocol

All the included women could drink only plain water. In the strict fluid regime group, women could drink up to 100 ml per hour until delivery. In the liberal fluid regime group, women could drink up to 500 ml during the first hour of the trial, and then up to 200 ml per hour until delivery. At the beginning of the trial, all women were administered intravenously 500 ml of Ringer's lactate solution. Further intravenous fluid volume replacement was allowed for all study participants. Participants were not allowed to eat or to drink non-water beverages during labor.

Assessment of thirst and drinking patterns

Using observational charts, we recorded the exact time and volume of consumed water/fluid volume administered intravenously during labor. The intensity of thirst during labor was assessed every hour until delivery using visual analog scale (VAS), where zero denoted no thirst and 100 denoted extreme thirst. The overall intensity of thirst during the labor was assessed after delivery using the same scale. All episodes of emesis were recorded whenever they occurred.

Assessment of patients satisfaction and other factors during labor

We measured overall satisfaction with the fluid regime and with other peri-labor exposures including the offer of epidural anesthesia, clarity of information provided by the medical team, support and availability of the medical team, presence of next of kin in the delivery room, and respect for privacy and needs. Satisfaction was measured using VAS, where zero denoted not satisfied and 100 denoted very satisfied. Women were also asked the following questions: Would you recommend drinking during labor to a friend? [yes/no]; Would you choose the same fluid regime during the next labor? [yes/no]; What amount of water would you prefer to drink during the next labor? [not to drink at all; drink less; the same; drink more].

Assessment of obstetrical outcomes

We collected the data on duration of the first and second stages of labor; duration of active phase of the second stage of labor; use of epidural anesthesia; fetal cardiac arrhythmia; delivery mode; 5min Apgar score; umbilical cord arterial pH and lactate; and admissions to the neonatal intensive care unit.

Statistical analysis

Seventeen participants in each arm would be needed to achieve 80% power to detect a mean difference of approximately 20/100 mm VAS scale for a significance level of 0.05. This difference was chosen based on multiple articles stating that a VAS pain score difference between 20 and 30 mm is significant for most patients [15,16]. We added 20% to account for loss to follow-up and recruited 40 patients (20 in each arm).

Normality of continuous variables was assessed by Shapiro-Wilk's test. Descriptive statistics are presented as median and interquartile range (IQR) for numeric variables, and numbers and percentages for categorical variables.

Categorical variables were analyzed using Chi-squared test with Yate's continuity correction and Fisher's exact test. The between-group difference was assessed with Mann–Whitney *U*-test with continuity correction. The associations were considered significant at the overall alpha level set at <0.05. Statistical

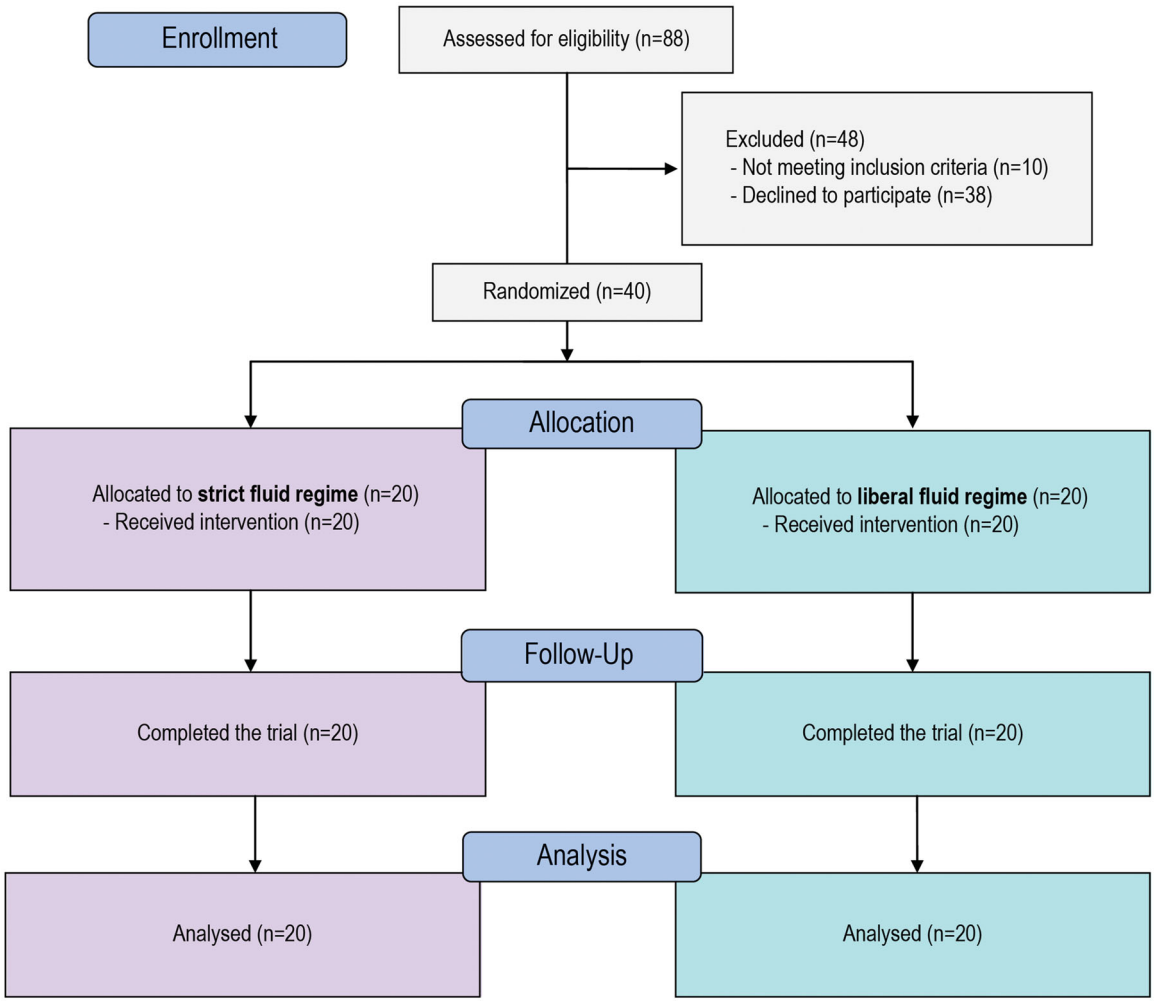

Figure 1. Consolidated standards of reporting trials (CONSORT) flow diagram.

analysis was performed with R Studio (Boston, MA, USA, Version 1.2.5033).

Compliance with ethical and reporting standards

The study was approved by the Institutional Review Board of Poitiers University Hospital (Comité de protection des personnes Ouest III; ID RCB: 2014-A00316-41-SC). Women were informed about the study during the routine control visit in the third trimester of pregnancy. Informed written consent was obtained from all study participants before submitting to any study procedures. This study was conducted according to the Consolidated Standards of Reporting Trials (CONSORT) guidelines [17].

Results

Between October and December 2014, 88 women were assessed for eligibility to participate in the study (Figure 1). Finally, 40 women were included in the study and randomly allocated to two intervention groups (20 to strict fluid regime and 20 to liberal fluid regime). There were no withdrawals or losses to follow-up. Characteristics of the study population are described in Table 1. The two intervention groups were comparable in terms of age, BMI, nulliparity ratio, and gestational age.

There were no significant differences in the quantity of water consumed *per os* between liberal fluid regime (median 450 ml, IQR: 244) and the strict fluid regime groups (median 425 ml, IQR: 398; $p = 0.99$). Women from strict fluid regime group received a significantly higher volume of fluids intravenously (median 1000 ml, IQR: 500) than from liberal fluid regime group (median 500 ml, IQR: 500; $p = 0.02$). Also, total fluid intake (*per os* and intravenous) was higher in the strict regime group (median 1450 ml, IQR: 606) than in liberal fluid regime group (median 975, IQR: 838, $p = 0.02$). Drinking pattern was similar in both groups (median four doses, IQR: 3 in the liberal fluid

Table 1. Baseline demographic and clinical characteristics, according to fluid regime.

	Strict fluid regime ($n = 20$)	Liberal fluid regime ($n = 20$)	p Value
Median maternal age, years (IQR)	27 (6)	29 (6)	0.84[†]
Median maternal BMI, kg/m^2 (IQR)	24 (6)	21 (4)	0.14[†]
Nulliparous women, n (%)	12 (60)	17 (85)	0.16[‡]
Median gestational age, weeks (IQR)	40 (1)	40 (1)	0.21[†]

[†]Mann–Whitney U-test; [‡]Chi-squared test.
BMI: body mass index; IQR: interquartile range.

Table 2. Obstetrical and neonatal outcomes, according to fluid regime group.

	Strict fluid regime ($n = 20$)	Liberal fluid regime ($n = 20$)	p Value
Obstetrical outcomes			
Epidural anesthesia, n (%)	19 (95)	17 (85)	0.61[‡]
Fetal cardiac arrhythmia, n (%)	6 (30)	8 (40)	0.74[‡]
Spontaneous vaginal delivery, n (%)	14 (70)	17 (85)	0.45[‡]
Assisted vaginal delivery, n (%)	6 (30)	3 (15)	0.45[‡]
Median duration of labor, minutes (IQR)			
Length of stay in delivery room	340 (195)	190 (128)	0.04[†]
Active phase of first stage of labor	180 (120)	120 (104)	0.20[†]
Second stage of labor	97 (115)	45 (114)	0.09[†]
Active phase of second stage of labor	17 (12)	9 (7)	0.02[†]
Neonatal outcomes			
5-min Apgar score < 7, n (%)	1 (5)	0 (0)	1.00[‡]
Median umbilical cord arterial lactate, mmol/L (IQR)	4.7 (3.1)	3.7 (2.6)	0.08[†]
Median umbilical cord arterial pH (IQR)	7.2 (0.1)	7.2 (0.1)	0.33[†]
Admission to neonatal intensive care unit, n (%)	2 (10)	0 (0)	0.49[‡]

[†]Mann-Whitney U-test; [‡]Fischer's exact test.
IQR: interquartile range.

regime; three doses, IQR: 3 in the strict fluid regime; $p = 0.67$). The intensity of thirst in liberal fluid regime group (median score 63, IQR: 45) was similar to strict fluid regime group (median score 49, IQR: 37; $p = 1.00$). Emesis was observed in one woman from strict fluid regime group and two women from liberal fluid regime group ($p = 0.57$).

General satisfaction with drinking-during-labor policy was higher in liberal fluid regime (median score 88, IQR: 21) than in restricted fluid regime group (median score 72, IQR: 21; $p = 0.03$). The groups did not differ in satisfaction scores regarding presence of next of kin, offer of epidural anesthesia, support and availability of the medical team, clarity of information provided by the medical team, and respect for privacy and needs (Supplementary Table S1).

Majority of the women from the liberal fluid regime group (17/20, 85%) and from the strict fluid regime group (17/20, 85%) declared they would recommend drinking during labor to a friend ($p = 1.00$). Eighteen women (90%) from the liberal fluid regime group and 14 (70%) from the strict fluid regime group declared that during the next labor, they would wish to drink as much as they did during the intervention ($p = 0.10$). Two women (10%) from the liberal fluid regime group and seven (35%) from the strict fluid regime group declared willingness to drink more during the next labor ($p = 0.12$).

There was no significant difference in the overall duration of the first and second stages of labor (Table 2). However, the active phase of the second stage of labor was significantly shorter in liberal fluid regime than in strict fluid regime group (median: 9 min, IQR: 7 vs. 17 min, IQR: 12; $p = 0.02$). Difference in length of stay in the delivery room was significantly shorter among women from liberal fluid regime than from strict fluid regime group (median: 190 min, IQR: 128 vs. 340 min, IQR: 195; $p = 0.04$). There were no significant differences in the use of epidural anesthesia, fetal cardiac arrhythmia, mode of delivery, 5-min Apgar scores, umbilical cord arterial lactate and pH, and the number of admissions to neonatal intensive care unit (Table 2).

Discussion

The practice of *nihil per os* is based mainly on the assumption that the intake of meals/drinks is associated with an increased risk of aspiration pneumonia [18]. Although many studies have emerged over the years that undermine the sense of this practice [12,13], it is still enforced in many healthcare centers [10,11].

Despite several trials provided evidence on the association between eating/drinking or not during labor [12,13], only one study examined maternal

satisfaction [14]. Consequently, because there is no evidence on maternal satisfaction, current guidelines on drinking during labor do not factor it in their opinions [3–9].

In our study, we found that the overall satisfaction with drinking policy during labor was significantly higher among women from the liberal fluid regime than from the strict fluid regime group, despite lower total fluid intake (summed *per os* and intravenous). Our results support the general hypothesis that with the liberalization of the fluid/meal regime, patient satisfaction increases, and their stress levels decrease. Our results are in line with an American study, which found that the overall satisfaction was higher among women having a high-protein drink during labor than among women having ice chips/water only [14]. They are also supported by an Iranian study, which reported that the restriction of fluid intake increased stress among multiparous women [19].

We found that in the liberal fluid regime group, the active phase of the second stage of labor was significantly shorter compared to the strict fluid regime group. A similar finding was also reported by Iranian study, in which drinking carbohydrate solution was associated with a shorter second stage of labor than in case of drinking water only [20]. However, the definition of the second stage of labor was unclear in that study. Our study also supports the evidence of the meta-analysis of the literature on the association between different eating and drinking regimes on obstetrical and neonatal outcomes (pooled sample size 3982 participants), which showed that labors under less limiting policies were, in general, shorter by about 16 min [13].

Another finding of our study is a significant difference in the length of stay in the delivery room between two groups (strict fluid regime median: 340 min, IQR: 195; liberal fluid regime median: 190 min, IQR: 128; $p = 0.04$). These observations might be relevant to policymakers and healthcare payers. Further research needs to examine more closely both the costs and benefits of such intervention in monetary terms.

The major limitation of our study is the lack of blinding, which might have influenced the maternal satisfaction score. Another limitation is no information on oxytocin administration, which might have been a confounding variable.

In conclusion, liberal fluid regime during labor was associated with higher general satisfaction scores among women. The active phase of the second stage of labor and length of stay in the delivery room were significantly shorter in the liberal fluid regime than in strict fluid regime group. Further research should be undertaken to investigate the reasons for these differences.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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