Review

Less-Restrictive Food Intake During Labor in Low-Risk Singleton Pregnancies

A Systematic Review and Meta-analysis

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OBJECTIVE: To evaluate benefits and harms of food intake during labor.

DATA SOURCES: Electronic databases such as MEDLINE and ClinicalTrials.gov were searched from their inception until October 2016.

METHODS OF STUDY SELECTION: We included randomized trials comparing a policy of less-restrictive food intake with a policy of more restrictive food intake during labor. The primary outcome was the mean duration of labor. Meta-analysis was performed using the random-effects model of DerSimonian and Laird to produce summary treatment effects in terms of either a relative risk or a mean difference with 95% confidence interval (CI).

TABULATION, INTEGRATION, AND RESULTS: Ten trials, including 3,982 laboring women, were included. All the studies involved laboring singletons considered at low risk because they had no obstetric or medical complications that would increase the likelihood of cesarean delivery. In three studies, women were allowed to select from a low-residue diet throughout the course of labor. One study had honey date syrup as the allowed food intake. Five studies had carbohydrate drinks as food intake in labor. The last one was the only trial that allowed unrestrictive food intake. In the included studies, all women in the intervention group were allowed the assigned food intake until delivery, whereas women in a control group were allowed only ice chips, water, or sips of water until delivery. A policy of less-restrictive food intake was associated with a significantly shorter duration of labor (mean difference –16 minutes, 95% CI −25 to −7). No other benefits or harms in obstetric or neonatal outcome were noticed. Regurgitation during general anesthesia and Mendelson syndrome did not occur in either group.

CONCLUSION: Women with low-risk singleton pregnancies who were allowed to eat more freely during labor had a shorter duration of labor. A policy of less-restrictive food intake during labor did not influence other obstetric or neonatal outcomes nor did it increase the incidence of vomiting. Operative delivery rates were similar.

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Restricting food intake during labor is common practice across many birth settings, with some women being allowed only sips of water or ice chips.[1–6] Work by Mendelson in the 1940s showed high morbidity and high mortality in pregnant women undergoing general anesthesia for cesarean delivery who inhaled either liquids or food from the stomach.[2] Oral intake is often restricted in laboring women as a result of concerns of aspiration in the event that general anesthesia is required.[5] Preventing Mendelson syndrome, although very rare, has been the rationale for oral food intake restriction in women during labor.[3] However, in modern obstetrics, the rate of general anesthesia is very low, approximately 5% in the overall population.[1,4,5]

In 2013, the American College of Obstetricians and Gynecologists and the American Society of Anesthesiologists recommended that "the oral intake of modest amounts of clear liquids may be allowed for

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uncomplicated laboring patients" but that "solid foods should be avoided in laboring patients." Moreover, "patients with risk factors for aspiration (eg, morbid obesity, diabetes, and difficult airway, or patients at increased risk for operative delivery) may require further restrictions of oral intake, determined on a case-by-case basis."[3] In contrast to American College of Obstetricians and Gynecologists and American Society of Anesthesiologists recommendations, the World Health Organization recommends that health care providers should not interfere with a woman's desire for oral intake during labor.[4]

Several randomized controlled trials (RCTs) have been published, providing contradictory results (Laifer SA, Siddiqui DS, Collins JE, Stiller RJ, Moffat SL, Loh EV. A prospective randomized controlled trial of oral intake of liquids during the first stage of labor [abstract]. Anesthesiology 2000; A53 (Poster 12); personal communication, U. Goodall and A.H. Wallymahmed, 2006).[7–14]

The aim of this systematic review and meta-analysis of RCTs was to assess benefits and harms of a policy of less-restrictive food intake during labor.

SOURCES

This review was performed according to a protocol designed a priori and recommended for systematic review.[15] Electronic databases (ie, MEDLINE, Scopus, ClinicalTrials.gov, EMBASE, Sciencedirect, the Cochrane Library at the CENTRAL Register of Controlled Trials, Scielo) were searched from their inception until October 2016. Search terms used were the following text words: "food," "drink," "labor," "labor," "restriction," "Mendelson," "aspiration," "general anesthesia," "morbidity," "mortality," "meta-analysis," "metaanalysis," "review," "randomized," "water," "ice chips," "randomised," "effectiveness," "guidelines," "carbohydrate," "sugar," and "clinical trial." No restrictions for language or geographic location were applied. In addition, the reference lists of all identified articles were examined to identify studies not captured by electronic searches. The electronic search and the eligibility of the studies were independently assessed by two authors (A.C., G.S.). Differences were discussed with a third reviewer (V.B.).

STUDY SELECTION

We included all RCTs comparing a policy of less-restrictive food intake (ie, study group) with a policy of more restrictive food intake (ie, comparison group) during labor. Food was defined as any nutritious substance that women eat or drink.

Randomized controlled trials on oral food intake and quasi-RCTs (ie, trials in which allocation was done on the basis of a pseudorandom sequence, eg, odd and even hospital number or date of birth, alternation) were eligible for inclusion. Studies on intravenous (IV) feeding were excluded.

We considered studies comparing any two or more of the following regimens for inclusion:

1) Unrestrictive intake of oral food and fluids
2) Allowing particular oral food or fluid regimens
3) Food intake restricted to oral carbohydrate-based fluids
4) Food intake restricted to only water
5) Complete restriction of food intake (other than sips of water or ice chips)

The risk of bias in each included study was assessed by using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Seven domains related to risk of bias were assessed in each included trial because there is evidence that these issues are associated with biased estimates of treatment effect: 1) random sequence generation, 2) allocation concealment, 3) blinding of participants and personnel, 4) blinding of outcome assessment, 5) incomplete outcome data, 6) selective reporting, and 7) other bias. Review authors' judgments were categorized as "low risk," "high risk," or "unclear risk" of bias.[15]

Two authors (A.C., G.S.) independently assessed inclusion criteria, risk of bias, and data extraction. Disagreements were resolved by discussion with a third reviewer (V.B.).

All analyses were done using an intention-to-treat approach, evaluating women according to the treatment group to which they were randomly allocated in the original trials. Primary and secondary outcomes were defined before data extraction. The primary outcome was the mean of duration of labor (in minutes), defined as time from randomization to delivery. The secondary outcomes were cesarean delivery, operative vaginal delivery (ie, either forceps or vacuum), Apgar score less than 7 at 5 minutes, maternal ketoacidosis, maternal vomiting, augmentation of labor, epidural analgesia, regurgitation during general anesthesia, Mendelson syndrome, and admission to the neonatal intensive care unit.

We planned to assess the primary outcome in subgroup analyses according to the type of food regimens used by the original trials. All authors were contacted for missing data.

The data analysis was completed independently by two authors (A.C., G.S.) using Review Manager 5.3.

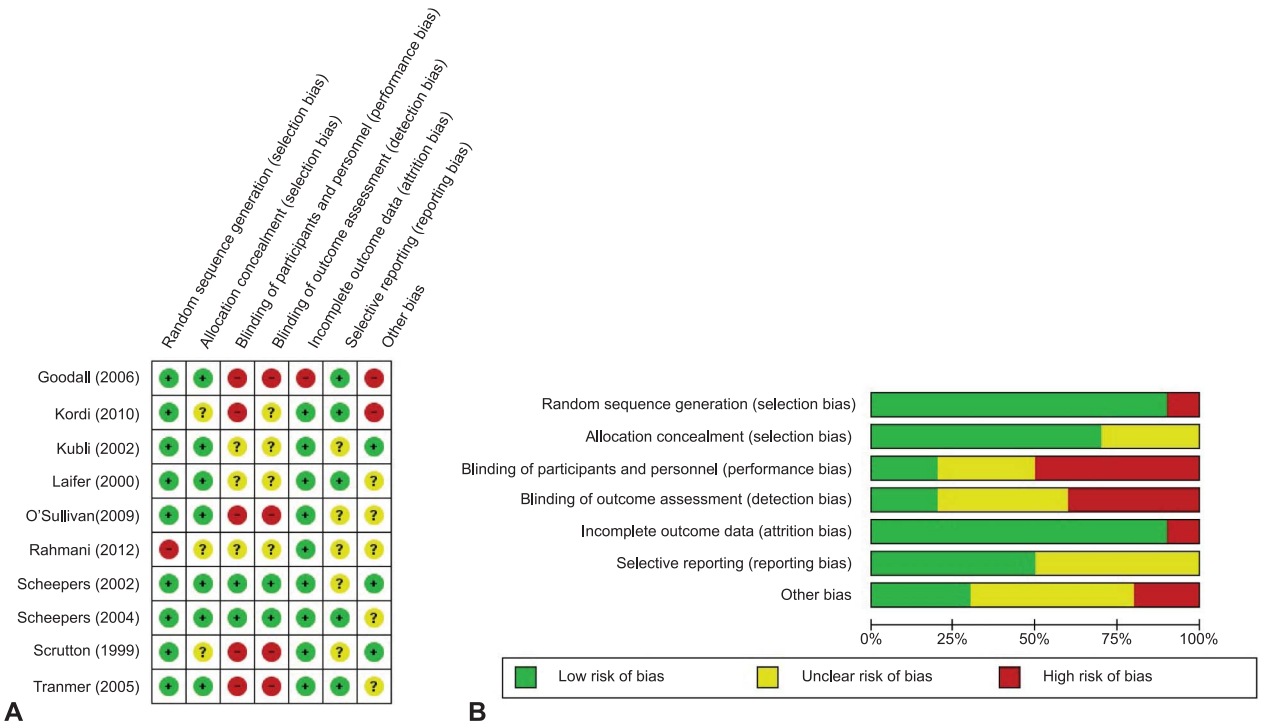

Fig. 1. Assessment of risk of bias. **A**. Summary of risk of bias for each trial. The *plus sign* indicates low risk of bias, the *minus sign* indicates high risk of bias, and the *question mark* indicates unclear risk of bias. **B**. Risk of bias items presented as percentages across all included studies.

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The completed analyses were then compared, and any difference was resolved by discussion with a third reviewer (V.B.).

Data from each eligible study were extracted without modification of original data onto custom-made data collection forms. A two-by-two table was assessed for relative risk; for continuous outcomes, mean±standard deviation were extracted and imported into Review Manager 5.3.

Meta-analysis was performed using the random-effects model of DerSimonian and Laird to produce summary treatment effects in terms of either a relative risk or a mean difference with 95% confidence interval (CI). Heterogeneity was measured using I^2 (Higgins I^2). For outcomes with zero events for both groups, 95% CIs were calculated by using the Poisson method.

Potential publication biases were assessed statistically by using Begg's and Egger's tests. $P<.1$ was considered statistically significant for publication bias.

The meta-analysis was reported following the Preferred Reporting Item for Systematic Reviews and Meta-analyses statement.[16] Before data extraction, the review was registered with the PROSPERO International Prospective Register of Systematic Reviews (registration No. CRD42016049205).

RESULTS

Ten trials, including 3,982 laboring women, were identified as relevant and included in the meta-analysis (Appendix 1, available online at http://links.lww.com/AOG/A926) (Laifer et al. Anesthesiology 2000; personal communication, U. Goodall and A.H. Wallymahmed, 2006).[7–14] One study was published only as abstract (Laifer et al. Anesthesiology 2000) and one as a personal communication (U. Goodall and A.H. Wallymahmed, 2006). No quasirandomized trials were included. Publication bias, assessed using Begg's and Egger's tests, was not significant ($P=.75$ and .84, respectively).

Five of the 10 included trials (Laifer et al. Anesthesiology 2000)[8–10,14] were judged as "low risk" of bias in most of the seven Cochrane domains related to the risk of bias (Fig. 1). All the included studies but one[13] had "low risk" of bias in "random sequence generation." Adequate methods for allocation of women were used in all the included trials except for three in which details on the methods used to conceal allocation were not reported.[7,11,13] In two double-blind placebo-controlled studies,[9,14] which used colored water as a placebo, neither the

Table 1. Characteristics of the Included Studies

Study	Study Location	Inclusion Criteria	Sample Size*	Intervention	Comparison	Primary Outcome
Scrutton, 1999[7]	United Kingdom	Singletons greater than 37 wk of gestation, cephalic presentation, cervical dilatation less than 5 cm	94 (46 vs 48)	Low-residue food	Water only	Duration of labor
Laifer SA et al. A prospective randomized controlled trial of oral intake of liquids during the first stage of labor [abstract]. Anesthesiology 2000	United States	Singletons greater than 37 wk of gestation, cephalic presentation	103 (48 vs 55)	Oral intake carbohydrate solution	Ice chips only	Cesarean delivery
Kubli et al, 2002[8]	United Kingdom	Singletons greater than 37 wk of gestation, cephalic presentation, cervical dilatation less than 5 cm	60 (30 vs 30)	Oral intake carbohydrate solution	Water only	Vomiting
Scheepers et al, 2002[9]	Netherlands	Singletons greater than 37 wk of gestation, nulliparous, cephalic presentation, cervical dilatation less than 5 cm	201 (102 vs 99)	Oral intake carbohydrate solution	Flavored water only	Duration of labor
Scheppers et al, 2004[14]	Netherlands	Singletons greater than 37 wk of gestation, nulliparous, cephalic presentation, cervical dilatation 8–10 cm	202 (100 vs 102)	Oral intake carbohydrate solution	Flavored water only	Operative delivery rate
Tranmer et al, 2005[10]	Canada	Singletons greater than 30 wk of gestation, nulliparous, cephalic presentation	328 (163 vs 165)	Unrestricted access to water and food	Ice chips and sips water only	Shoulder dystocia
Personal communication, U. Goodall and A.H. Wallymahmed, 2006	United Kingdom	Singletons greater than 37 wk of gestation, cephalic presentation, cervical dilatation less than 5 cm	301 (110 vs 191)	Food low in fat and fiber with a neutral pH	Sips water only	Maternal satisfaction
O'Sullivan et al, 2009[12]	United Kingdom	Singletons greater than 36 wk of gestation, nulliparous, cephalic presentation, cervical dilatation less than 6 cm	2,426 (1,219 vs 1,207)	Low-fat food	Ice chips and sips water only	Vaginal delivery
Kordi et al, 2010[11]	Iran	Singletons greater than 37 wk of gestation, nulliparous, cephalic presentation, cervical dilatation less than 4 cm	90 (45 vs 45)	Honey date syrup	Sips water	Duration of labor
Rahmani et al, 2012[13]	Iran	Singletons greater than 36 wk of gestation, cephalic presentation, cervical dilatation at 3–4 cm	177 (87 vs 90)	Oral intake carbohydrate solution	Water only	Duration of labor

* Total number (number in the intervention group vs number in the control group).

participants nor the investigators were aware of the treatment assignments) (Fig. 1).

All the studies involved laboring women with singleton gestations considered at low risk because there were no obstetric or medical complications that would increase the likelihood of cesarean delivery (Table 1). No studies enrolled women with multiple gestations (Appendix 2, available online at http://links.lww.com/AOG/A926). Only three studies[10,12,13] report data regarding IV fluids in labor. O'Sullivan et al[12] report use of IV fluids in 67% (820/1,219) in the intervention group and in 69% (838/1,207) in the comparison group. Tranmer et al[10] report a rate of 46.0% (75/163) and 43.0% (71/165) in the intervention and the comparison groups, respectively. Rahmani et al[13] did not record the number of women who received IV fluids, but they report a mean of IV fluids used during labor of 401 mL in the intervention group and 472 mL in the comparison group.

In three trials, women in the less-restrictive intake groups were allowed to select from a low-residue diet throughout the course of labor (Appendix 3, available online at http://links.lww.com/AOG/A926) (personal communication, U. Goodall and A.H. Wallymahmed, 2006).[7,12] One study had honey date syrup as the allowed food intake.[11] Five studies had carbohydrate drinks as food intake in labor (Laifer et al. Anesthesiology 2000).[8,9,13,14] Finally, Tranmer et al[10] was the only trial that allowed unrestrictive food intake. In the included studies all women in the intervention group were allowed the assigned food intake until delivery. The women in the control group were allowed only ice chips, water, or sips of water until delivery.

Table 2 shows the primary and secondary outcomes in the overall analysis. We found that a policy of less-restrictive food intake was associated with a significantly shorter duration of labor (mean difference –16 minutes, 95% CI −25 to −7; nine studies, 3,675 participants, I^2=77%; Table 2). No other benefits or harms in obstetric or neonatal outcome were noticed, including cesarean delivery (Fig. 2) or operative vaginal delivery (Fig. 3) rates. Regurgitation during general anesthesia and Mendelson syndrome did not occur in either group (personal communication, U. Goodall and A.H. Wallymahmed, 2006).[12] However, none of the included studies report the number of women who underwent general anesthesia (Table 2). For the intervention group, the 0 of 1,329 instances for regurgitation during general anesthesia results in 95% CI of 0–0.28% or an upper bound of 1:360 patients. Similarly, for Mendelson syndrome, 0 of 1,382 had 95% CI of 0–0.27% with an upper bound of 1:375 cases (Table 2).

Table 2. Primary and Secondary Outcomes

Outcome	Intervention Group	Control Group	I^2 (%)	RR (95% CI) or MD
Duration of labor (min) (Laifer SA et al. A prospective randomized controlled trial of oral intake of liquids during the first stage of labor [abstract]. Anesthesiology 2000)[7–14]	380	396	77	**−16.01 (−24.91 to -7.12)**
Cesarean delivery (Laifer SA et al. Anesthesiology 2000)[7–10,12–14]	440/1,794 (24.6)	435/1,791 (24.3)	55	1.01 (0.69–1.47)
OVD[7–10,12–14]	461/1,746 (26.4)	448/1,673 (26.8)	90	0.87 (0.54–1.39)
Apgar score less than 7 at 5 min[7,8,10,12,13]	16/1,544 (1.0)	23/1,535 (1.5)	0	0.70 (0.37–1.31)
Maternal ketoacidosis[14]	36/163 (22.1)	36/165 (21.8)	NA	1.01 (0.6–1.52)
Maternal vomiting[7,8,12,13]	519/1,381 (37.6)	500/1,370 (36.5)	61	1.00 (0.81–1.23)
Augmentation of labor[7,8–10,12]	817/1,559 (52.5)	837/1,544 (54.2)	3	0.98 (0.91–1.05)
Epidural analgesia[7,8–10,12]	1,027/1,559 (65.9)	1,014/1,544 (65.7)	30	1.02 (0.95–1.09)
Regurgitation during general anesthesia (personal communication, U. Goodall and A.H. Wallymahmed, 2006)[12]	0/1,329*	0/1,398*	NA	(0–0.28%)†
Mendelson syndrome (personal communication, U. Goodall and A.H. Wallymahmed, 2006)[12]	0/1,382	0/1,372	NA	(0–0.27%)†
Admission to NICU[12,13]	61/1,306 (4.7)	62/1,297 (4.8)	NA	0.97 (0.769–1.37)

RR, relative risk; CI, confidence interval; MD, mean difference; OVD, operative vaginal delivery; NA, not applicable; NICU, neonatal intensive care unit.

Data are n/N (%) unless otherwise specified.

Not all the variables have been recorded in every trial; results therefore are accompanied with the number of cases in which the outcomes were registered (n) with the references of the included trials. Proportions are presented as percentage of n rather than as percentages of the total population. Boldface data, statistically significant.

* Regurgitation during general anesthesia, denominator refers to all women included in the trials and not to women who underwent general anesthesia. Numbers of women who underwent general anesthesia were not available.

† Poisson method.

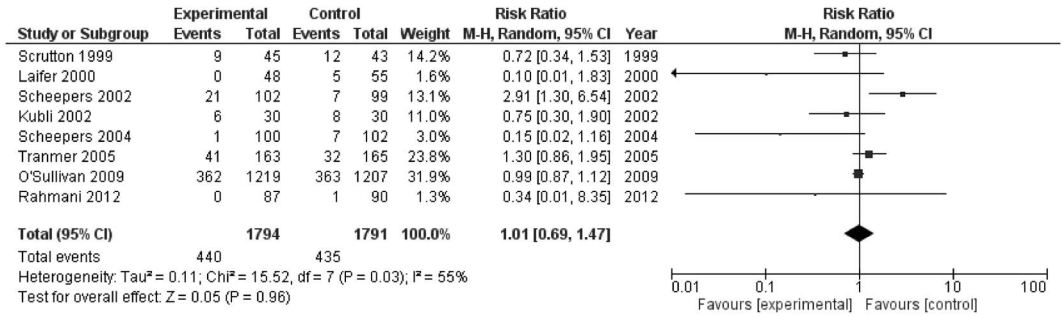

Fig. 2. Forest plot for the risk of cesarean delivery. M-H, Mantel-Haenszel; CI, confidence interval; df, degrees of freedom. *Ciardulli. Food Intake in Labor. Obstet Gynecol 2017.*

Subgroup analyses revealed that unrestricted food intake or a low-residue diet was not associated with any significant effect on duration of labor (Appendix 4, available online at http://links.lww.com/AOG/A926). Oral carbohydrate-based fluids were associated with a significant 15 minutes' shorter duration of labor (mean difference −15.40 minutes, 95% CI −25.10 to −5.71; five studies, 743 participants, I^2=67%) compared with water only (Laifer et al. Anesthesiology 2000)[8,9,13] (Appendix 4, http://links.lww.com/AOG/A926).

DISCUSSION

This meta-analysis from 10 RCTs (Laifer et al. Anesthesiology 2000; personal communication, U. Goodall and A.H. Wallymahmed, 2006),[7–14] including 3,982 laboring women, showed that women with low-risk singleton pregnancies who were allowed to eat during labor had a 16-minute shorter duration of labor. A policy of less-restrictive food intake during labor did not influence other obstetric or neonatal outcomes, nor did it increase the incidence of vomiting. Operative delivery rates were also similar. Most data on this 16-minute shorter duration of labor come from RCTs including women having oral carbohydrate fluids as food intake, starting before 6 cm dilation and allowed until delivery. The rate of Mendelson syndrome for a woman undergoing general anesthesia in this clinical setting is very low, but possibly, based on the 95% CI, as frequent as approximately 1:375.

Our data differ from a Cochrane study by Singata et al.[1] This systematic review did not find any significant effect with a policy of less-restrictive food intake during labor in singleton pregnancies compared with a policy of more restrictive food intake.[1] This meta-analysis, including only five trials,[7–10,12] concluded that, because the evidence showed no benefits or harms, there was no justification for the restriction of fluids and food in labor for women at low risk for complications.[1]

Our study has several strengths. The 10 trials included had a low risk of allocation bias by Cochrane Collaboration tool assessment. Intent-to-treat analysis was used. In addition, publication bias was not apparent by statistical analysis.

Limitations of our study are mostly inherent to the limitations of the included studies. The only two studies that blinded the women and the clinicians were the trials by Scheepers et al[9,14] comparing carbohydrate fluids with placebo-colored water. Studies that compared eating and drinking in labor with ice chips or water only were not able to blind women or clinicians and hence some outcomes may be subject to

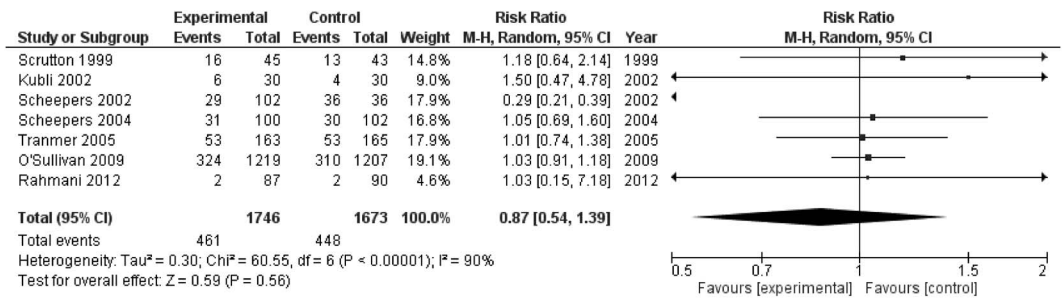

Fig. 3. Forest plot for the risk of operative vaginal delivery. M-H, Mantel-Haenszel; CI, confidence interval; df, degrees of freedom. *Ciardulli. Food Intake in Labor. Obstet Gynecol 2017.*

bias. Almost half of the women included (60.9%) in the analysis (2,426/3,982) came from one large well-designed trial.[12] We acknowledge that some outcomes were underpowered; however, those are indeed uncommon outcomes (eg, regurgitation during general anesthesia, Mendelson syndrome) with an estimated overall rate less than 1%. None of the included trials looked at women at high risk for cesarean delivery. Only two studies (personal communication, U. Goodall and A.H. Wallymahmed, 2006)[12] report data regarding regurgitation during general anesthesia and Mendelson syndrome. They report no events in either group, but data on number of women who underwent general anesthesia were not available. A major shortcoming of this meta-analysis was the different policies of food intake used by the original trials.

Historically, food intake has been restricted in labor because of fear of aspiration during possible general anesthesia.[6] Current practices in obstetric anesthesia have successfully reduced rates of general anesthesia and many of the known complications.[5] The Royal College of Anaesthetists suggested that fewer than 15% of emergency and fewer than 5% of planned cesarean deliveries should be performed under general anesthesia.[17] Published departmental audits have reported rates of general anesthesia of 2–10% in the overall population.[18] In our meta-analysis, the chance of cesarean delivery for a laboring woman with a low-risk singleton pregnancy with cephalic presentation at term was approximately 25%. In this subset of women, the risk of general anesthesia during cesarean delivery is estimated to be approximately 5%.[19] Moreover, even in case of general anesthesia, the incidence of pulmonary aspiration is very low, described as between 1 in 900 to 1 in 10,000.[5,17–19]

In the United States, oral intake during labor is limited primarily to clear liquids, although hospitals with fewer deliveries allow more oral intake during the latent phase than do hospitals with larger services.[20] However, allowing nonclear liquids or solid foods is uncommon in either phase of labor, regardless of hospital size.[20]

Denial of food can be seen as authoritarian and intimidating, which may for some women increase fear and apprehension during labor. Eating and drinking may allow mothers to feel normal and healthy.[6] Women not given food intake restrictions tend to follow their normal dietary pattern in early labor but reduce their food intake as labor becomes more painful.[21] Our meta-analysis showed that a policy of less-restrictive food intake in low-risk singleton pregnancies is associated with shorter labor. A policy of less-restrictive food intake is also associated with no evidence of harm, but the power was insufficient to imply safety owing to the current extremely low incidence of aspiration pneumonia in obstetrics.

The biologic plausibility to explain our findings is not completely clear. The American College of Sports Medicine has reported that dehydration of greater than 2% of body mass may compromise physiologic function, impairing exercise function.[22] The fluid and calorie loss during labor is very high as are the body's requirements for hydration and nutrition. A meta-analysis showed that the duration of labor in low-risk nulliparous women may be shortened by a policy of IV fluids at a rate of 250 mL/h rather than 125 mL/h.[23]

In summary, a policy of less-restrictive food intake is associated with a shorter duration of labor compared with more restrictive food intake. Less-restrictive food intake during labor does not influence other obstetric or neonatal outcomes in low-risk singleton gestations, nor does it increase the incidence of vomiting. Operative delivery rates were similar.

No studies looked specifically at women at increased risk for complications, requiring further well-designed trials in this subset of women.

REFERENCES

1. Singata M, Tranmer J, Gyte GM. Restricting oral fluid and food intake during labour. The Cochrane Database of Systematic Reviews 2013, Issue 8. Art. No.: CD003930. doi: 10.1002/14651858.CD003930.pub3.
2. Mendelson CL. The aspiration of stomach contents into the lungs during obstetric anesthesia. Am J Obstet Gynecol 1946; 52:191–205.
3. Oral intake during labor. ACOG Committee Opinion No. 441. Obstet Gynecol 2009;114:714.
4. World Health Organization. Care in normal birth: report of a technical working group. Maternal and Newborn Health/Safe Motherhood Unit, Family and Reproductive Health. Geneva (Switzerland): World Health Organization; 1997.
5. Robinson M, Davidson A. Aspiration under anaesthesia: risk assessment and decision-making. Contin Educ Anaesth Crit Care Pain 2014;14:171–5.
6. Simpkin P. Stress, pain and catecholamines in labor, Part 2. Stress associated with childbirth events: a pilot survey of new mothers. Birth 1986;13:234–40.
7. Scrutton MJ, Metcalfe GA, Lowy C, Seed PT, O'Sullivan G. Eating in labour. A randomised controlled trial assessing the risks and benefits. Anaesthesia 1999;54:329–34.
8. Kubli M, Scrutton MJ, Seed PT, O'Sullivan G. An evaluation of isotonic 'sport drinks' during labor. Anesth Analg 2002;94: 404–8, table of contents.
9. Scheepers HC, Thans MC, de Jong PA, Essed GG, Le Cessie S, Kanhai HH. A double-blind, randomised, placebo controlled study on the influence of carbohydrate solution intake during labour. BJOG 2002;109:178–81.

10. Tranmer JE, Hodnett ED, Hannah ME, Stevens BJ. The effect of unrestricted oral carbohydrate intake on labor progress. J Obstet Gynecol Neonatal Nurs 2005;34:319–28.
11. Kordi M, Salek Nasiri N, Safarian M, Esmaeili H, Shadjuo K. The effect of oral honey-date syrup intake during labor on labor progress of nulliparous women. Iranian J Obstet Gynecol Infertility 2010, 13:23–30.
12. O'Sullivan G, Liu B, Hart D, Seed P, Shennan A. Effect of food intake during labour on obstetric outcome: randomised controlled trial. BMJ 2009;338:b784.
13. Rahmani R, Khakbazan Z, Yavari P, Granmayeh M, Yavari L. Effect of oral carbohydrate intake on labor progress: randomized controlled trial. Iran J Public Health 2012;41:59–66.
14. Scheepers HC, de Jong PA, Essed GG, Kanhai HH. Carbohydrate solution intake during labour just before the start of the second stage: a double-blind study on metabolic effects and clinical outcome. BJOG 2004;111:1382–7.
15. Higgins JPT, Green S, editors. Cochrane handbook for systematic reviews of interventions, version 5.1.0. Available at: http://handbook.cochrane.org/. Retrieved October 20, 2016.
16. Moher D, Liberati A, Tetzlaff J, Altman DG; PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. J Clin Epidemiol 2009;62:1006–12.
17. Thomas J, Paranjothy S. National sentinel caesarean section audit report. Royal College of Obstetricians, Gynaecologists' Support Unit. London (UK): RCOG Press; 2001.
18. McGlennan A, Mustafa A. General anaesthesia for cesarean section. Contin Educ Anaesth Crit Care Pain 2009;5:148–51.
19. Bloom SL, Spong CY, Weiner SJ, Landon MB, Rouse DJ, Varner MW, et al. Complications of anesthesia for cesarean delivery. Obstet Gynecol 2005;106:281–7.
20. Hawkins JL, Gibbs CP, Martin-Salvaj G, Orleans M, Beaty B. Oral intake policies on labor and delivery: a national survey. J Clin Anesth 1998;10:449–51.
21. Parson M, Bidewell J, Griffths R. A comparative study of the effect of food consumption on labour and birth outcomes in Australia. Midwifery 2007;23:131–8.
22. Casa DJ, Clarkson PM, Roberts WO. American College of Sports Medicine roundtable on hydration and physical activity: consensus statements. Curr Sports Med Rep, 2005;4:115–27.
23. Dawood F, Dowswell T, Quenby S. Intravenous fluids for reducing the duration of labour in low risk nulliparous women. The Cochrane Database of Systematic Reviews 2013, Issue 6. Art No.: CD007715. doi: 10.1002/14651858.CD007715.pub2.