2021

Hydration and Nutrition During Labor

Muna Abdi
Bethel University

Katie Cooper
Bethel University

HYDRATION AND NUTRITION DURING LABOR

A MASTER'S PROJECT

SUBMITTED TO THE GRADUATE FACULTY

OF THE GRADUATE SCHOOL

BETHEL UNIVERSITY

BY

MUNA ABDI AND KATIE COOPER

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF SCIENCE IN NURSING

MAY 2021

BETHEL UNIVERSITY

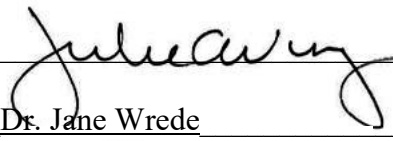
Hydration and Nutrition During Labor

Muna Abdi and Katie Cooper

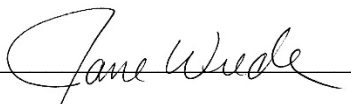
May 2021

Approvals:

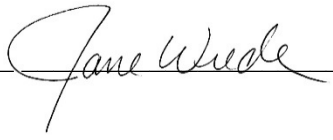
Project Advisor Name: Dr. Julie Ann Vingers

Project Advisor Signature: 

Second Reader Name: Dr. Jane Wrede

Second Reader Signature: 

Director of Nurse-Midwifery Program Name: Dr. Jane Wrede

Director of Nurse-Midwifery Program Signature: 

Acknowledgments

We would like to extend our heartfelt appreciation and gratitude to Dr. Julie Ann Vingers, our primary advisor, without whose support we could not have written this Capstone and completed this program. Thank you Dr. Vingers for taking the time to carefully read each draft of our paper, especially during the summer months. We recognize that time between semesters is precious family time, and appreciate your dedication which allowed us to succeed in the fall as we faced completing both spring and fall clinical hours. We would also like to thank Dr. Jane Wrede for being our second reader. Finally, we extend our sincere gratitude to Rebecca Otterness, our editor, whose advice, kind notes, and excellent suggestions made our paper shine.

Muna's Acknowledgements

Thank you to my amazing husband Mohamed and our two daughters Yasmin and Janan, for your love, support, and encouragement to pursue my dream of becoming a nurse-midwife. You have witnessed the joys and the trials that came with this journey, yet you listened and pushed me to continue. I would also like to thank my incredible and wonderful mother for your unconditional love and support throughout this journey. To my siblings, I am so blessed to have you all to lean on, thank you for all the times you have watched Yasmin and Janan. Finally, thank you for sharing your knowledge and wisdom with me to my fantastic and amazing preceptors. You have encouraged me, motivated me, and uplifted me.

Katie's Acknowledgements

To my family: Dan, Laurie, Ben, Max, and Diane, thank you for your unwavering encouragement and support in so many ways as I pursued my dream to become a nurse and then nurse-midwife. I am grateful for your willingness to listen as I processed both the joyful and challenging days. Thank you for reminding me of who I am, and that I am capable of fulfilling

what God has called me to. Thank you also to Jean, Mark, and Mandy who each welcomed me into their homes for a semester. I am incredibly grateful to the dedicated nurses and midwives I worked alongside and learned from in Papua New Guinea, who started me on this path. Thank you for welcoming me and modeling compassionate, skilled care to the women in your communities.

Abstract

Background/Purpose: Historically women have birthed in their own homes. As birth moved to the hospital, concerns surrounding gastric aspiration following general anesthesia led to restrictive intake policies for laboring women. Current professional recommendations vary regarding nutritional intake in labor. The purpose of this paper is to determine whether there are differences in maternal outcomes when different forms of hydration and nutrition are used during labor.

Theoretical Framework: Neuman's Systems Model was the theoretical framework used to guide the research process. This model includes four systems (client-client, environment, health, and nursing) which work together to promote holistic wellness.

Methods: A thorough database search using CINAHL, PubMED, Science Direct, Scopus initially identified 37,155 articles. Inclusion criteria included articles which discussed oral nutrition and hydration during labor and maternal outcomes, English language, Level I-III, and published between 2009-2020. Articles published prior to 2009 were excluded along with Level IV and V articles, and duplicates. Ultimately 25 articles were selected for inclusion.

Results/Findings: Oral intake of foods and fluids and intravenous fluids significantly improved the duration of labor, mode of delivery, and reduced the need for oxytocin induction or augmentation without any adverse effects on maternal and neonatal outcomes. Multiple research studies demonstrated that intravenous dextrose fluids significantly reduced labor duration. Restrictions to oral intake during labor can impede the physiological labor process.

Implications for Research and Practice: Providing intravenous dextrose fluids and eliminating the prohibition of oral intake during labor may improve labor outcomes. By allowing women to eat and drink during labor and recommending beneficial options, the physiological need for

nutrition is honored. Nurse-Midwives embrace midwifery's art and science as they partner with women through education, counseling, and shared decision-making. Women are provided with the space to make those decisions for their own body's needs.

Keywords: oral intake, oral intake during labor, labor and eating, food intake during labor, maternal outcomes, carbohydrates in labor, labor outcomes with oral intake, impact of oral intake on labor progress, intravenous hydration, oral hydration.

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Chapter One: Introduction

For all of history, women have birthed in the sacred space of their homes. They were able to move around freely, eating and drinking as desired. As birth transitioned from home to hospitals, the discussion of allowing women to have oral intake became one that was decided by the institutions providing care for women rather than the women themselves. In 1946, Dr. Curtis Mendelson correlated the increased maternal mortality rate following general anesthesia with aspirated stomach contents, suggesting that this could be avoided by restricting oral intake (Sperling et al., 2016). Accordingly, obstetric units adopted nothing-by-mouth orders for women during labor (American College of Nurse-Midwives [ACNM], 2016). This practice that many obstetric units across the country adopted is still in effect in the 21st century. It is particularly notable when one considers the tremendous breakthroughs and advancements both in the healthcare field and the technology world.

Statement of Purpose

The purpose of this paper is to review recent evidence-based literature to examine the question, “Are there differences in maternal outcomes when different types of nutrition and hydration are used during labor?” Recent and relevant scholarly articles will be reviewed to evaluate labor outcomes when intake of oral fluids or solid foods is provided to low-risk women during labor and birth. A background on the history of restricting oral intake during labor will be discussed along with a discussion of the available research. Applications to nurse-midwifery practice will also be shared along with the current recommendations of professional organizations serving midwives, obstetricians, and anesthesiologists.

Evidence Demonstrating Need

During childbirth, the body requires energy and replenishment to prevent maternal exhaustion and promote overall fetal well being (Sperling et al., 2016). The uterus consists of muscle fibers, and like any other muscle in the body, it requires food to meet the energy required for labor. It has been demonstrated that carbohydrates replenish the body during exercise and protect the body from ketosis and fatigue (Rodriguez et al., 2009, as cited by Dekker, 2021). While some research has been completed studying the benefits of offering different types of oral fluid or food intake during labor, further review is needed prior to promoting change from previously held positions (Shea-Lewis et al., 2018).

Significance to Nurse-Midwifery

For as long as midwifery has existed, midwives have been with women. Women and midwives are a natural team. The very essence of that relationship and partnership is that midwives have always listened to women. The transition from home births to hospitals in the 20th-century birth has been viewed as a process that requires multiple interventions rather than a physiological process where women were built to do this very thing of laboring and birthing their children (Sperling et al., 2016). Hence, as midwives are advocates for the physiological process of labor, it is critical to recognize that restricting oral intake of food and fluids may create sources of anxiety and stress that impede labor's natural process (Tadaumi et al., 2019).

In preserving the art and science of midwifery, a Hallmark of Midwifery to consider would be "Empowerment of women and persons seeking midwifery care as partners in health care" (ACNM, 2020, p.3). Allowing women to make well-informed plans for their health and coming alongside them in reaching the ultimate goal of healthy mothers and babies when allowing low-risk women to eat during labor is essential (ACNM, 2020). Other relevant

Hallmarks are "Advocating for informed choice, shared decision making, and the right to self-determination" and "Incorporation of evidence-based care into clinical practice" (ACNM, 2020, p.3).

Furthermore, when considering the physiological Pearls of Midwifery, “Allowing women to eat in early labor and drink throughout” is one of the first listed (ACNM, 2019). Hence, as nurse-midwives support women throughout the birth, they should encourage women at low risk of gastric aspiration to eat and drink throughout labor, and share specific nutrition options which may be beneficial.

Theoretical framework

Theory-guided research is crucial to the advancement of nursing as a discipline while also guiding the research process (Quinn, 2016). The Neuman Systems Model conceptual framework looks closely at four systems: the client-client system, the environment, health, and nursing to better understand how interventions can be applied for moving toward the continuum of health and wellness (Aylward, 2006). Neuman maintained that the client's health and wellness are dependent on preserving and maintaining the integrity of these four systems. Health is a reflection of living energy. Although health may fluctuate throughout a client's lifespan, these four systems provide a groundwork to accomplish satisfactory and overall wellness and ultimately preserve the quality of life.

The client-client system is further broken down into a flexible line of defense, normal defense line, line of resistance, and client variables (Aylward, 2006). The flexible line of defense is essentially a buffer that attempts to keep stressful factors out of the client's system—looking at the individual or multiple factors that induce stress for the client (Angosta et al., 2014). Clients may exhibit acute signs and symptoms when the flexible line of defense is impacted, such as lack

of sleep, lack of nutritional intake, or decreased fluid intake leading to dehydration. On the other hand, the normal line of defense assesses the baseline of the client's history of wellness. The line of resistance is essentially the last resort or mechanism that clients have in order to resist the internal and external stressors affecting their health (Angosta et al., 2014). Without immediate interventions and action plans by healthcare, losing the line of resistance can lead to severe complications for the client. Nonetheless, the factors mentioned above that contribute to the client-client systems are also viewed through the client's physiological, psychological, sociocultural, developmental, and spiritual health.

The environmental system of Neuman Systems Model is another critical factor of maintaining the client's overall wellness. It requires assessing the internal, external, and created environment. Health is the third conceptual framework. It allows one to consider where the client is on the spectrum of health and illness (Aylward, 2006). Neuman describes wellness as life when energy is created and reserved, and death occurs when energy is totally depleted. Finally, nursing is a key aspect of Neuman's Model as nursing is the link unifying all of the client's systems discussed above to reach optimal health (Florczak et al., 2012).

The Neuman Systems Model is an appropriate framework for evaluating hydration and nutrition in promoting holistic wellness in laboring women. The client-client system, the environment and the health system are essential to enhance the flexible defense line and resistance line (Angosta et al., 2014). This includes the midwife educating women by introducing conversations regarding oral intake during labor early in prenatal visits. Prenatal counseling allows women to gain knowledge, to ask questions about benefits and risk factors of eating and drinking during labor, and to mitigate stress related to restriction of oral intake during labor. Importantly, the flexible defense line and the line of resistance can be sustained from an

interpersonal stance by incorporating family to support the laboring mother (Angosta et al., 2014). A woman's cultural traditions of consuming particular foods and beverages can impact the strength of the line of resistance. Flexible lines of defense, which serve to strengthen coping skills by reducing risk factors for stress, can also be applied with the addition of specific foods shown to improve outcomes (Florczak et al., 2012).

An example of a flexible line of defense is the intake of date fruits. Research has found that eating date fruits in late pregnancy and during labor can increase the chances of spontaneous labor, decrease the length of the second stage, and decrease the need for induction or augmentation of labor (Rahmani et al., 2012; Razali et al., 2017). Allowing women to consume date fruits can be viewed as a beneficial line of defense. Implementing this intervention promotes holistic wellness and health maintenance in relation to the concepts of the Neuman Systems Model.

Position Statements

Currently, the position of the professional organization of nurse-midwives, ACNM, maintains that birth is a physiologic process and that supportive care should be emphasized in cases of low-risk laboring women (ACNM, 2016). While the small risk of aspiration should be discussed with women during the antepartum period, the principles of self-determination are integral to decision-making. It should be noted that while healthy women with low-risk pregnancies are at very low risk of aspiration, if risks arise during the course of care, additional discussions should be had regarding further restriction of intake. Additionally, they note that anesthesia is the causal factor increasing the risk of aspiration, not oral intake on its own. Other integral components of making these clinical decisions are a thorough and ongoing evaluation of risk factors and appropriate communication with the physician and anesthesia team. With a

complete discussion of the risks as well as benefits of oral intake, women at low risk of aspiration should be permitted the autonomy to make the decision regarding their own oral intake during labor (ACNM, 2016).

The American Society of Anesthesiologists [ASA] (2016) maintains that for low-risk laboring women, moderate intake of clear liquids should be permitted. However, they recommend that laboring women avoid consuming solid foods. It is interesting to note that it is the presence of particulate matter in the liquid which is more influential than the volume of liquid consumed (ASA, 2016).

Arising from the guidelines of the ASA are the recommendations of UpToDate. In their discussion of the management of normal labor and birth, they address oral intake during labor. The UpToDate article by Funai and Norowitz (2021) shares the ASA's stance that clear liquids should be permitted to laboring women at low risk of cesarean delivery, and solid foods should be avoided. If oral intake restriction is necessitated due to risk factors complicating the pregnancy or labor course, women should be given intravenous hydration (Funai & Norowitz, 2021).

The professional body of the American College of Obstetrics and Gynecology [ACOG] shares a position statement as well regarding oral intake during labor. ACOG maintains that while laboring women should be allowed clear liquids for oral intake, solid foods should be restricted (ACNM, 2016). However, ACOG released a bulletin in 2009 stating that low-risk women should be given a choice to eat solid foods. It recognized that with anesthesia advancements, there is minimal evidence for continuing with clear liquids only (ACNM, 2016).

On the other hand, the World Health Organization [WHO] recommends that due to the high demand of energy needed during labor and the overall maternal and fetal well being,

laboring women should be allowed to eat and drink as desired (Sperling et al., 2016). Additionally, the Cochrane review of systematic reviews concluded that withholding oral fluids and solids to laboring women has been shown to have no advantages or disadvantages (Singata et al., 2013). However, qualitative studies of women's views on oral intake restrictions have concluded these restrictions are viewed negatively and promote dissatisfaction with labor experiences (Ozkan, 2017).

Summary

As midwives, allowing low-risk women to eat and drink during labor is a key part of promoting physiological birth. Chapter One introduced the topic of different types of oral nutrition and hydration in labor as it pertains to maternal outcomes and identified disagreements among professional organizations. The evidence supporting the need for women to maintain adequate intake during labor was discussed along with the historical context of oral restrictions. Neuman's Systems theory was used as the theoretical framework to guide the research. The official positions of different professional organizations were then compared. Chapter Two will explain the methods by which this literature review was completed including the search strategies and criteria for inclusion and evaluation. Then, Chapter Three will discuss the findings of the literature review and analyze their findings. Finally, Chapter Four will conclude with a response to the practice question, recommendations for future research, and implications for nurse-midwifery practice.

Chapter II: Methods

The purpose of this chapter is to describe the research methods employed in gathering literature pertinent to the chosen topic. Search strategies used to identify research articles, criteria for inclusion and exclusion, as well as criteria for evaluating the articles selected will all be discussed. In addition, the evaluation process for categorizing studies will be discussed.

In considering the most up-to-date scientific research, this literature review included articles published between 2009 and 2020. The following databases were used to select data: CINAHL, Science Direct, PubMed, and Scopus. The search terms used to identify articles included labor and eating, food intake during labor, oral intake during labor, maternal outcomes intake labor, carbohydrates in labor, eating and drinking during labor, labor outcomes with oral intake, effects on oral intake during labor, labor progress and oral intake, oral carbohydrate intake labor, date fruit intake labor, the impact of oral intake on labor progress, and eating during labor and labor progress. In addition to the database searches, the reference lists of the research articles were analyzed to extract additional pertinent research articles.

Inclusion criteria included articles that discussed oral nutrition, hydration, and maternal outcomes. As well, the chosen articles were published from 2009-2020, were available in full text, and written in English. Both national and international studies were included in this literature review. Exclusion criteria, therefore, included articles published before 2009, those that were not available in English, systematic reviews, expert opinions, literature reviews, and Level IV or V articles as described by Dang & Dearholt's (2018) criteria for research appraisal (Appendix II). After a thorough review of the databases, 25 articles were ultimately chosen out of 37,161 that were initially identified from the databases. The articles were selected following evaluation of titles for relevance, reading abstracts, removing duplicate results, and screening for

primary research. The selected studies were conducted around the world in Iran, Saudi Arabia, the United States, Turkey, Israel, Norway, South India, England, France, Malaysia, and Jordan. Twenty articles were randomized, controlled trials, several of which were double-blinded. The remaining five articles included retrospective observational cross-sectional studies, phenomenological qualitative studies, and prospective cohort studies.

The criteria for the evaluation of research studies used in this paper were drawn from the Johns Hopkins Research Evidence Appraisal Tool (Dang & Dearholt, 2018). This tool categorizes articles from Level I-V, with quality ratings of Low, Good, or High. Of the 25 articles chosen, 20 were randomized controlled trials, placing them in the category of Level I articles. Level I articles are the highest in the hierarchy of ratings, according to Dang and Dearholt (2018), which includes both randomized controlled trials as well as meta-analyses that contain only randomized controlled trials. The remaining five articles were Level III, a category that includes nonexperimental and qualitative studies, as well as meta-syntheses (Dang & Dearholt, 2018). The Level III articles that were chosen used a variety of methods including being prospective, cohort studies, retrospective observational cross-sectional studies, and phenomenological qualitative studies. No Level II, IV, or V articles were chosen for inclusion in this paper.

Articles that met the inclusion and exclusion criteria were then given a quality rating based on the caliber of the study methods. The Johns Hopkins Research Evidence Appraisal Tool uses the designation of High, Good, or Low/Major Flaw when describing the quality of a research study (Dang & Dearholt, 2018). Twenty of the articles were of Good quality, with the remaining five articles being of High quality. Factors used to determine whether a study was Good or High quality included whether the results could be generalizable with sufficient sample

size for study design, whether it was double-blinded, presence of definitive conclusions, whether recommendations were consistent, and based on a comprehensive review of the literature (Dang & Dearholt, 2018). None of the selected articles discussed in this paper were of Low quality.

Chapter III: Literature Review and Analysis

This chapter will address a synthesis of the 25 matrix articles (see Appendix I). Their purpose, methods, results, major findings, and conclusions will be presented. The articles will be divided into major themes under the headings of oral hydration, intravenous hydration, and solid food intake. Finally, the overall strengths and weaknesses of the available literature will be discussed along with a preview of the final chapter.

Synthesis of Matrix

The articles used in this review were organized using the matrix format. The format for the matrix was designed showing four columns: purpose/sample, design, results, and strength/limitations. Setting, level of evidence, and quality of the evidence are also included. Additional components of the matrix include author's conclusions and recommendations, and a summary for current clinical practice questions. The research appraisals were done by using the criteria from the John Hopkins Research Evidence Appraisal Tool (Dang & Dearholt, 2018). After a thorough review of the available literature, 25 articles were selected and further discussed in this section.

Synthesis Of Major Findings

Of the 25 articles selected for inclusion in the matrix, 14 studied hydration through intravenous fluids, oral intake, or both. Interventions of intravenous hydration varied in volume infused per hour as well as whether the fluids contained dextrose, Lactated Ringer's (LR) solution, or 0.9% normal saline. Ten of the studies viewed oral intake of foods. Oral intake of foods studied included dates, garlic, raisins, and various probiotic-containing foods. The findings and statistical significance related to neonatal and maternal labor outcomes are discussed in the following pages.

Oral and Intravenous Intake of Fluids

Duration of Labor

In their double-blind, randomized, controlled trial in Iran, Ahadi et al. (2020) researched the effect of different hydration types on labor duration, oxytocin administration, and the incidence of prolonged labor in term, nulliparous women in spontaneous labor (N=188). Of the three groups, the first (n=63) received 125ml/hr of LR intravenously and were permitted ad lib oral intake of apple juice, orange juice, and water. The second group (n=65) received 125ml/hr of dextrose 5% intravenous solution with ad lib oral intake. The third group (n=60) only consumed oral fluids ad lib with no intravenous supplementation. The dextrose intervention was statistically significant with shorter labor duration ($p<0.001$), shorter first and third stages ($p<0.001$), less need for oxytocin augmentation ($p<0.001$), and a lower frequency of prolonged labor ($p=0.001$). The authors concluded dextrose 5% solution can safely be used in labor and may lead to favorable results in low-risk, nulliparous women in spontaneous, active labor (Ahadi et al., 2020).

Another study in Iran, completed by Direkvand-Moghadam and Rahmani (2012), compared the effects of intravenous hydration with LR on labor length, need for oxytocin augmentation, and prolonged labor, leading to adverse outcomes. The participants included (N=120) nulliparous women between 38 and 40 weeks gestation who were in active labor of 4-5cm dilation. The first group (n=30) received 60mL/hr of LR, the second group (n=30) received 120mL/hr, and the third group (n=30) received 240mL/hr, with all three groups encouraged to drink water and soft drinks. The control group had the usual care, which did not include intravenous hydration. A significant decrease in length of the first stage of labor ($p=0.001$) and a shorter second stage of labor ($p=0.01$) in all intervention groups compared to the control was

noted. They concluded that allowing unrestricted oral intake of fluids and providing intravenous hydration to nulliparous women decreased labor duration, oxytocin administration rates, and reduced incidences of prolonged labor (Direkvand-Moghadam & Rahmani, 2012).

Edwards et al. (2014) undertook a randomized study on the effects of type and volume of intravenous hydration on maternal and neonatal outcomes, and labor course. Their multi-center, randomized controlled trial included (N=311) term, nulliparous women with uncomplicated pregnancy in spontaneous labor in the United States. The first group (n=125) received LR solution with 5% dextrose (D5LR) at 125ml/hr with oral intake restricted, the second (n=105) received D5LR at 250ml/hr with restricted oral intake, and the third (n=101) received D5LR at 25ml/hr with ad lib oral fluid intake. No significant difference was found regarding labor duration, endometritis, rate of oxytocin administration, wound complications, low neonatal Apgars, maternal fever, or cesarean birth. A significantly lower incidence of clinical chorioamnionitis (p=0.048) was evident in both the D5LR groups. While intravenous hydration appears to be safe, neither form of hydration improved labor performance or reduced labor dystocia. Oral intake of fluids did not lead to adverse outcomes, including maternal aspiration, pulmonary edema, or perinatal mortality (Edwards et al., 2014).

Garmi et al. (2017) investigated the effects of type and volume of intravenous fluid hydration on laboring women in an Israeli study which included nulliparous women (N=300) at term gestation. All of the intervention groups were given LR for intravenous hydration and were permitted ad lib oral intake of water, ice chips, or tea with sugar. The first intervention group (n=125) was assigned LR at 125ml/hr, the second group (n=101) received LR at 250ml/hr, and the third group (n=98) received normal saline with 5% dextrose at 125ml/hr. The study's findings indicated no significant difference in prolonged labor (p=0.74), second stage duration

(p=0.73), oxytocin administration (p=0.89), mode of delivery (p=0.21), intrapartum fever (p=0.08), or early postpartum hemorrhage (p=0.74). They concluded that varying intravenous fluids and administration rates did not alter labor duration or other outcomes (Garmi et al., 2017).

In South India, Kavitha et al. (2011) performed a randomized study, comparing the effects of oral and intravenous hydration on labor duration with (N= 293) low-risk, nulliparous women at term gestation in spontaneous active labor. The control group (n=99) was permitted to consume water and coconut water with no intravenous hydration. The first intervention group (n=98) received LR at 125mL/hr, and the second intervention group (n=96) received LR at 250mL/hr. Both intervention groups were allowed oral intake of fluids as desired. Intravenous fluids led to a significant decrease in the incidence of vomiting (p=0.001) when compared to oral fluids alone. The other labor outcomes including oxytocin requirements, duration (both normal and prolonged), mode of delivery, neonatal and maternal outcomes did not demonstrate significant differences between groups. The benefit was noted that the use of intravenous fluids can decrease vomiting in low-risk primigravida (Kavitha et al., 2011).

Fong et al. (2017) used a double-blind, randomized controlled trial to evaluate whether prolonged labor will be decreased by the rate of intravenous fluid given during labor with nulliparous women (N=275) in the United States. Of the three groups, group one (n=92) received normal saline running at 250mL/hr, group two (n=92) received 5% dextrose in normal saline running at 125mL/hr, group three (n=90) received 5% dextrose in normal saline at 250mL/hr. Neither increasing intravenous fluids nor the type of fluids was found to affect labor duration (p=0.92) for nulliparous women (Fong et al., 2017).

Similarly, Sharma et al. (2012) viewed the link between the initiation of parenteral fluids and labor outcomes for nulliparous women (N=250) in active labor. The first group (n=122)

received 5% dextrose fluid alternated with normal saline running at 175mL/hr, while the control group (n=128) received normal saline fluids only, at the same rate. A statistically significant difference was noted with dextrose fluids having a shorter duration of labor (p=0.000), less prolonged labor (p=0.009), and less augmentation with oxytocin (p=0.004). The authors concluded that the administration of dextrose 5% alternating with normal saline fluids reduced the incidence of prolonged labor, decreased labor duration, with less need for oxytocin augmentation (Sharma et al., 2012).

Shrivastava et al. (2009) compared normal saline with and without dextrose and the effect on labor progress for nulliparous women (N=289) in spontaneous, active, uncomplicated labor in the United States. The results were statistically significant as participants who had dextrose 5% or 10% were able to complete labor significantly faster than participants who received normal saline (p=0.02), with shorter second stage (p=0.01), and fewer prolonged labors (p=0.01). Hence, the administration of dextrose fluid can improve the labor course of nulliparous women (Shrivastava et al., 2009).

In a randomized controlled trial, Paré et al. (2017) studied the effect of dextrose intravenous fluid given to term nulliparous women (n=193) in France undergoing induction of labor with Bishop scores > 6. The control group (n=97) received 250mL/hr of normal saline, and the intervention group (n=96) received 5% dextrose in normal saline at 250mL/hr, with both groups receiving oxytocin for induction. Notably, the study demonstrated significant differences between groups with the dextrose group having shorter first, second, and third stages of labor when compared as a whole (p=0.024). There was no significant difference in mode of delivery, Apgar scores, or arterial cord pH. Dextrose fluid administration was found to decrease duration

of induction in nulliparous women with a favorable cervix, without increasing the risk of cesarean birth or operative delivery. (Paré et al., 2017).

Mode of Delivery

In Iran, Sehhatie et al. (2017) assessed labor outcomes such as mode of delivery, use of oxytocin, and prolonged labor when LR, dextrose fluids, or oral fluids are administered with low-risk, term, nulliparous women (N=200). Group one (n=67) received LR at 125ml/hr in addition to oral fluids of water, apple juice, or orange juice. Group two (n=67) received dextrose 5% at the same rate plus oral fluids, and group three (n=67) received only oral fluids. There is a statistically significant difference in the mode of delivery (p=0.002) with the dextrose group having the fewest cesarean deliveries as well as a decreased rate of oxytocin augmentation (p=0.001), less prolonged labor (p=0.001), and higher one minute Apgars (p=0.004). Dextrose fluids were shown to give considerable benefits of lower cesarean delivery, oxytocin augmentation, and decreased prolonged labor, and higher one-minute Apgars (Sehhatie et al., 2017).

Simonet et al. (2020) studied whether carbohydrate intake during labor can decrease instrumental vaginal delivery, and can impact labor duration, mode of delivery, self-reported evaluations of maternal well-being, breastfeeding outcomes, vomiting, and length of hospitalization among (N=3,984) low-risk women in spontaneous labor. The carbohydrate intervention group (n=2,014) was advised to drink 200mL of apple or grape juice every three hours, along with water, while the fasting group (n=1,970) was only permitted water. Both groups received intravenous fluids that contained 5% glucose at 60mL/hr. There were no significant differences between the groups with mode of delivery, duration of labor, maternal well-being, vomiting, breastfeeding or length of hospitalization, and no evidence that increased

risk or adverse effects occurred with oral intake. Therefore, allowing low-risk women to consume fruit juice and water does not have a negative effect on maternal outcome (Simonet et al., 2020).

Pain Perception During Labor

Ergol et al. (2012) studied the effect of oral fluids (grape juice compared to NPO) during labor on perception of labor pain and labor duration in a randomized, controlled trial for term, low-risk nulliparous women (N=110). The intervention group was allowed to consume as much juice as desired during the course of labor while the control group was not permitted any oral fluids or food. There was a significant reduction in total labor length in the intervention group (p=0.016), however, no significant difference for each individual labor stage. The intervention group reported an increased perception of pain which did not reach statistical significance (first stage p=0.468; second stage: p=0.696; fourth stage: p=0.109). Allowing low-risk women oral intake of fluids during labor may reduce labor duration but did not affect the perception of pain (Ergol et al., 2012).

Taavoni et al. (2019) studied the effects of honey supplementation during labor and the influence of labor pain for (N=80) low-risk, term primigravida women in spontaneous active labor. The groups were randomized with the intervention group (n=40) receiving 2.5 teaspoons of honey in 150mL of water initially then readministered every 30-60 minutes. The control group (n=40) received 150mL of water only. Pain scores were recorded using a 0-10 scale every 30 minutes until cervical dilation of 8cm was reached. A significant reduction in pain was noted with the intervention group (p=0.028) at 30 minutes, at 60 minutes (p=0.000), at 90 minutes (p=0.0003), and at 120 minutes (p=0.022). It was concluded that low-risk primigravida women have significantly reduced pain during labor with honey consumption (Taavoni et al., 2019).

Patient Satisfaction

Vallejo et al. (2013) completed a randomized controlled study looking at incidents of nausea, emesis, overall patient satisfaction, and gastric emptying in women ≥36 weeks gestation (N=150) after providing them high protein drinks during labor with an epidural in place. Participants were less than ≤5cm at the time of epidural placement and also had been NPO for four hours. The intervention group (n=75) received 325mL of 30g protein drink to be consumed within 15 minutes along with ice chips and water. The control group (n=75) only had ice chips and water. There was no significant difference in nausea, vomiting, neonatal Apgars at one minute and five minutes, nor the mode of delivery between groups. However, there was a significant difference in patient satisfaction with the group that received the protein drink ($p=0.007$). Consuming the protein drink increased satisfaction with women without contributing to nausea, vomiting, or delayed gastric emptying (Vallejo et al., 2013).

Oral Intake of Solid Foods

Date Fruit Intake

Oral intake of foods was studied in 10 of the 25 included articles. Ahmed et al. (2018) completed one of several studies researching the effects of date fruit consumption on labor outcomes. In Saudia Arabia, they performed a randomized, controlled trial to evaluate whether date fruits affected the onset and progress of labor with (N=89) primiparous to grand multiparous women admitted in labor. Upon admission, one group (n=32) was given 7 Rotana dates along with 250mL of water, the other group (n=26) was given dates alone, and the control group (n=31) was neither given dates nor water. The women who consumed date fruits during their labors had a significantly shorter first stage of labor ($p=0.024$) and third stage of labor ($p<0.001$),

were less likely to have labors with meconium-stained amniotic fluid (31%), had less incidence of caput (p=0.034) and had higher 5-minute Apgar scores (p=0.035). Date fruit consumption during labor shortened the first and third stages of labor with other advantageous outcomes (Ahmed et al., 2018).

Date fruits were the topic of research in an Iranian study completed by Kordi et al. (2017) to determine the effect of date fruit consumption in late pregnancy on labor progress in nulliparous women (n=182) between 37-38 weeks gestation. The intervention group (n=91) consumed 6-7 dates daily beginning at 37 weeks, while the other group (n=91) did not consume dates during that time period. The study found a statistically significant decrease in duration of active phase (p=0.0001), second stage (p=0.0001), third stage (p=0.004), and need for oxytocin augmentation (p<0.001) for the intervention group. Consuming dates in pregnancy beginning at 37 weeks can shorten the length of labor and decrease the need for oxytocin augmentation in nulliparous women when spontaneous labor occurs. Further research is needed to determine the exact amount of dates that need to be consumed (Kordi et al., 2017).

Al-Kuran et al. (2011) examined the effects of date fruits eaten prior to labor onset on delivery outcomes in nulliparous women (N=114) at 36 weeks gestation with uncomplicated pregnancies. Group one (n=69) consumed six dates per day starting at 36 weeks gestation while the control group (n=45) was advised not to consume any dates. Significant differences were noted with greater cervical dilation in admission for the data-consuming participants (p=0.0005). The first, second, and third stages of labor were significantly shorter (p=0.05 for all three stages). The intervention group had significant differences in incidence of intact membranes (p=0.0007), onset of spontaneous labor (p=0.024), and need for augmentation with oxytocin or induction (p=0.036). Finally, the cesarean birth between the two groups was significantly lower in the

intervention group (p=0.05). Hence, the consumption of dates reduces not only the duration of labor and incidence of cesarean birth but also the need for labor induction and augmentation with oxytocin (Al-Kuran et al., 2011).

Date fruits were again the focus of a randomized, controlled trial by Razali et al. (2017) in Malaysia with low-risk primiparous women (N=154) in order to determine the fruit's effect on reducing need for oxytocin augmentation. The intervention group (n=77) was randomized to consume 7 dates daily from 37 weeks gestation until the onset of labor, while the control (n=77) abstained from consuming dates. Those in the intervention group had a significantly lower need for oxytocin augmentation (p=0.04), with no significant difference in the increase in cervical dilation. It was therefore concluded that the intake of date fruits during the late third trimester of pregnancy can increase the likelihood of spontaneous labor and reduce the need for labor augmentation (Razali et al., 2017).

Probiotic Foods and Alliums

In a large prospective cohort study, Myhre et al. (2013) investigated the influence of food with antimicrobial and prebiotics properties in relation to risk of spontaneous preterm delivery in pregnant women (N=18,888) of whom (n=950) had uncomplicated pregnancies with spontaneous preterm delivery between 22-36 weeks gestation. Alliums (including garlic, onion, leek, and spring onion) and dried fruits (raisins, apricots, prunes, figs, and dates), were correlated with decreased risk of spontaneous preterm delivery (p=0.005). Of those studied, garlic had the strongest link of reducing preterm delivery (p=0.017). Dried fruits, especially raisins, were associated with reducing preterm premature rupture of membranes (PPROM) (p=0.008) (Myhre et al., 2013).

Furthermore, Myhre et al. (2011) evaluated the effects of probiotic food intake on reducing pregnancy complications including the risk of spontaneous preterm delivery among pregnant women (N=18,888). Statistically significant correlations were noted between intake of probiotic food items, particularly dairy, and decreased spontaneous preterm delivery (p=0.044), which increased in significance (p=0.038) after adjustment for parity, maternal educational level, and physical activity (Myhre et al., 2011).

Carbohydrate Drinks

In Iran, Rahmani et al. (2012) performed a randomized controlled trial with low-risk nulliparous women (N=177) at 36 weeks or greater gestation in early labor to explore the effectiveness of oral carbohydrate intake during labor on the duration of labor and other neonatal and maternal outcomes. The intervention group (n=87) was given the choice between 3 dates with 100mL water, 3 dates with 100ml light tea without sugar, or 100mL orange juice as the carbohydrate intervention, and the control group (n=90) fasted as routine practice. The intervention group had a significantly shorter length of the second stage of labor ($p<0.05$), however there was no significant difference between groups in any of the other outcomes including duration of active phase or third stage, type of delivery, frequency of vomiting, operative or cesarean birth, or neonatal outcomes. There was no aspiration noted in the study. Offering oral carbohydrates to low-risk, laboring women significantly reduced second stage duration without adverse effects (Rahmani et al., 2012).

Oral Intake of Food and Fluids

Out of the 25 articles selected for inclusion, four articles included both food and fluid intake in their research and analysis (Kardel et al., 2010; O'Sullivan et al., 2009; Ozkan et al., 2017; Shea-Lewis et al., 2018).

Ad Lib Oral Intake

In a double-blind, randomized controlled trial in Norway by Kardel et al. (2010), all of the participants (N=213) at 36 weeks or greater gestation with uncomplicated pregnancies were allowed to self-regulate their dietary intake to determine whether an energy drink decreased labor duration in nulliparous women. The control group (n=102) was given 1 liter of placebo drink at the onset of labor, while the intervention group (n=111) was given 1 liter of isotonic energy drink to consume at the onset of labor. Consuming an energy drink did not significantly change outcomes (p=0.68) in duration of first or third stages of labor, total duration of labor, use of epidural anesthesia, need for augmentation, incidence of instrumental deliveries, cesarean sections, or Apgar scores. They concluded that consuming an energy drink did not affect the duration of labor in healthy nulliparous women, and women do not require energy aside from self-regulated intake (Kardel et al., 2010).

O'Sullivan et al. (2009) completed a randomized controlled trial including 2,426 nulliparous women at 36 weeks or greater gestation to determine the effect of oral intake of food on a normal vaginal delivery, neonatal outcomes, or length of labor. The intervention group (n=1,227) consumed a low-fat low-residue diet with water, while the control group (n=1,216) had only water and ice chips. No significant difference between groups was noted with the mode of delivery (p=0.77) or length of labor (p=0.975). There was no significant difference in five-minute Apgars of less than 7 (p=0.33) or rates of admission to neonatal intensive care (p=0.81). Eating in labor did not improve neonatal or maternal outcomes, nor were there adverse effects to withholding food (O'Sullivan et al., 2009).

A retrospective observational, cross-sectional study by Shea-Lewis et al. (2018) compared maternal and neonatal outcomes including type of delivery, maternal disposition to

postpartum, and neonatal Apgar scores in laboring women (N=2,784). When comparing the ad lib, or eating as desired during labor (n=1,198) group and in the NPO/ice chips group (n=1,599), the NPO group had much higher labor complications (p=0.02) with a higher probability of cesarean rates (p<0.001). Nonetheless, there was not a significant difference in neonatal Apgars at one minute and five minutes nor in morbidity or mortality rates in either group. Maternal oral intake during labor did not pose adverse effects for neonatal or obstetric outcomes (Shea-Lewis et al., 2018).

Sentiments Regarding Intake Restriction

Ozkan et al. (2017) focused their qualitative study on the effects of restricting oral intake of fluids and food, viewing the feelings and thoughts of women with a sample size of (N=30) participants. The interview questions of the study included "How did restriction of fluid or food intake make you feel while you were waiting for labor?", "Did hunger and thirst affect you during labor", "How did being hungry in the prenatal period affect you in the postnatal period?" (Ozkan et al., 2017, p.237). The study found that multiparous women, being more experienced, tended to come to the hospital after they ate and drank water, and therefore tolerated labor better. Participants of the study voiced feelings of hunger, thirst, and fatigue due to the oral restrictions of fluids and food during labor which ultimately affected the natural course of labor for them (Ozkan et al., 2017).

Critique of Strengths and Weaknesses

Out of the 25 articles reviewed in this section, 20 were Level 1, highlighting the high quality of evidence demonstrated in these articles of review. The studies reviewed were strengthened by the randomization and controls in place, and often were double-blinded. Most articles researched a variety of outcomes including the mode of delivery, maternal and neonatal

adverse outcomes, and even thoughts and feelings surrounding restriction of oral intake. Strengths of the articles included adequate sample sizes to draw the conclusion of encouraging low-risk women to regulate oral intake during labor, without any adverse outcomes to both women and their babies. Another strength of the literature was their settings in multiple countries which reflect diverse obstetrical environments and practices. Oral foods such as dates and probiotics have demonstrated good correlation not only in reducing labor duration and use of augmentation or induction of oxytocin but also decreased risk for spontaneous preterm delivery.

Limitations of the studies included the need for larger and more diverse sample sizes. The majority of the research included in this synthesis demonstrated adequate samples for the study size in order to draw out conclusions and positive correlation for maternal outcomes during labor. However, there is still a need for further research which includes both nulliparous and multiparous women, and with diverse geographical backgrounds and birth sites. Most articles studied nulliparous, low-risk women which is not widely generalizable to the greater population. The addition of this research will contribute to generalizable findings which can change clinical practice.

Summary

This chapter has synthesized the major findings of 25 articles. The themes that developed during the evaluations of these articles included oral intake and intravenous fluid administration, oral intake of foods and fluids, and oral intake of solid foods. Although the majority of the studies concluded that low-risk women benefit from oral intake of fluids and foods, limitations were primarily related to most samples including only nulliparous women and the hard evidence needed to change clinical practice guidelines. Chapter four will synthesize the findings of the

literature, identify trends and gaps in the literature, discuss implications for midwifery practice, and make recommendations for future practice.

Chapter IV: Discussion, Implications and Conclusions

The purpose of this final chapter is to answer the question, "Are there differences in maternal outcomes when different types of nutrition and hydration are used during labor?" Using the John Hopkins Research Evidence Appraisal Tool, twenty-five articles were reviewed and were synthesized in chapter three. A final synthesis of those articles will be completed in this chapter. At the same time, the literature trends and gaps will be examined and implications for nurse-midwifery practice will be identified. Neuman's System Theory will be applied along with a discussion of recommendations for future research.

Synthesis of Findings

Duration of Labor

Multiple studies showed a reduction in labor duration when oral and intravenous fluids were combined (Ahadi et al., 2020; Direkvand & Rahmani, 2012; Ergol et al., 2012; Sharma et al., 2012; & Shrivastava et al., 2009). Further research mentions that oral fluid restrictions impede the physiological labor process, leading to dysfunctional labor patterns and the need for cesarean delivery (Direkvand-Moghadam & Rahmani, 2012) . However, studies conducted with similar methodology discovered that neither increasing parenteral fluids nor altering the type of intravenous fluids had any impact on labor duration (Edwards et al., 2014; Fong et al., 2017; & Garmi et al., 2017). Importantly, there were no adverse effects noted following these interventions. As intravenous hydration was not noted to have adverse effects, and in many studies led to positive outcomes related to labor duration, it should be considered and utilized as a tool when supporting women in labor.

Mode of Delivery

Multiple studies have shown that oral intake of solids and liquids, with or without intravenous fluids, resulted in no harm in maternal or fetal assessments, and did not impact labor outcomes (O'Sullivan et al., 2009). Research has shown that dextrose intravenous fluids may shorten the duration of labor without increasing the risk for cesarean or operative delivery (Ahadi et al., 2020; Sharma et al., 2012; Shrivastava et al., 2009). On the other hand, when women were provided with fruit juice it did not impact labor outcomes nor modify the risk of instrumental delivery (Pare et al., 2017; Simonet et al., 2020). Furthermore, allowing low-risk women to choose their dietary intake did not impose harm nor lead to any obstetric or neonatal complications. In fact, the group allocated to have no oral intake had a higher rate of intrapartum complications and cesarean birth, further supporting the idea that strict nothing-by-mouth policies may be detrimental both physiologically and psychologically (Shea-Lewis et al. 2018). The promising aspects of this literature review are that several studies with combined participants of over 10,000 women displayed no adverse effects of oral intake for either maternal and fetal outcomes (Edwards et al., 2014; Fong et al., 2017; Garmi et al., 2017; Kavitha et al., 2011; O'Sullivan et al., 2009; Simonet et al., 2020, & Shea-Lewis et al., 2018). This body of research suggests that allowing women to take oral fluids presents no harm and women should be allowed to take oral fluids during labor.

Pain Perception During Labor

Two studies discussed the perception of pain. Taavoni et al. (2019) evaluated honey as in intervention, and discovered a significant reduction in pain for low-risk primigravida. While primigravida women have been shown to experience more pain during labor than multigravida, honey was shown to significantly reduce pain for low-risk primigravida for up to 120 minutes after consumption. This simple, cost-effective intervention can dramatically change primiparous

women's perception of pain and may likely improve their overall labor experience. Pain is a physiological response that is individualized to each woman during labor. Honey also has antibacterial, antiviral, anti-cancer properties, and antioxidant properties (Taavoni et al., 2019). Further research could help determine if honey provides other benefits for pregnant women both antenatally and intrapartum. However, in a similar study, but with a different population, Ergol et al. (2012) noted that with oral intake of grape juice, there was no change in perception of pain; therefore, more study is needed to differentiate the specific benefits of honey versus other oral carbohydrates. Future research could also compare honey and grape juice as interventions.

Patient Satisfaction

One study found women's satisfaction with their labors was significantly improved when provided with a high protein beverage compared to ice chips or water without delaying gastric emptying, which is significant for its relation to gastric aspiration (Vallejo et al., 2013). Far too often, the "what if" concern of whether a woman will aspirate during general anesthesia is inflated to restrict oral intake during labor. Labor and birth is a life-changing time in a woman's life, so their emotional well-being and satisfaction with care should be balanced along with valid concerns for safety. In another study women who were not permitted to eat or drink during labor, unsurprisingly reported feelings of hunger, thirst, and fatigue (Ozkan et al., 2017). These feelings led to dissatisfaction in the woman's labor experience and even disturbed the physiological process of labor (Ozkan et al., 2017). With the advancements of anesthesia medications and techniques, it is essential to consider the emotional and physiological impact of restricting oral intake of food and fluids on low-risk women.

Oxytocin Augmentation

Research further demonstrated that intravenous hydration, particularly fluids with dextrose has the potential to significantly reduce the need for oxytocin augmentation. Ensuring that women stay hydrated during labor and receive dextrose fluids for energy is therefore of crucial importance in promoting labor progression (Ahadi et al., 2020; Sharma et al., 2012). Another positive outcome of this literature review is that the mean total duration of labor was reduced to two hours with dextrose fluids compared with five hours in the ringer fluids and eight hours in the oral intake. This suggests that dextrose fluids would be beneficial for nurse-midwives' patients during labor. Other research has also noted that consuming dates reduces the need for oxytocin induction and augmentation, and including dates in a woman's diet should be considered in the late third trimester as well as during labor for their proven benefits (Razali et al., 2017). Of the date fruit-consuming women only 37% needed labor augmentation compared to likely to 50% augmentation need for labor in the non-date fruit-consuming women (Razali et al., 2017). By encouraging women to consume date fruits during the late third trimester and labor, there could be significant positive changes leading to women going into active labor spontaneously, progressing normally, with less need for induction and augmentation.

Date Fruit Intake

Multiple studies highlighted the importance of date fruits in contributing to maternal and fetal health while also reducing the need for labor induction, augmentation along with shortening overall labor duration and even beneficial in preventing postpartum hemorrhage (Kordi et al., 2017; Rahmani et al., 2012, Razali et al., 2017; & Al-Kuran et al., 2011). Sustaining maternal energy is vital for labor progress and maternal strength, and overall fetal wellbeing. The date fruit contains carbohydrates, proteins, vitamins, and 15 different salts and minerals (Ahmed et al., 2018). Included as well are saturated and unsaturated fatty acids that contribute to

prostaglandin production, allowing oxytocin receptors to respond better to oxytocin for an adequate contraction pattern. Furthermore, date fruits are known to have antioxidant and anti-inflammatory properties. Thus, supporting immune health, providing the energy needed for labor, and calcium properties allow for better myometrial contractility producing effective uterine contractions (Ahmed et al., 2018). The benefits of date fruit consumption were demonstrated in the above research with over 500 participants. This indicates that further research with a larger cohort of women would be beneficial for nurse-midwives in sharing with their patients the positive outcomes of date fruit intake.

Probiotic Foods and Alliums

An incidental finding while reviewing this literature revealed a surprising discovery. Foods such as dried raisins, apricots, prunes, dates, and figs, and alliums such as onion, garlic, leek, and spring onion were correlated with decreased risk of spontaneous preterm delivery (Myhre et al., 2013). The effects were attributed to antimicrobial and prebiotic factors in those foods. This research further demonstrated that raisins were associated with decreased risk of PPROM, in addition to finding that dairy consumption leads to decreased spontaneous preterm birth (Myhre et al., 2011). Further research in the form of randomized controlled trials is needed to determine the protective effect of probiotic foods and whether the lack of intake of those foods is a risk factor (Myhre et al., 2013; Myhre et al., 2011). As date fruits have already been demonstrated to have value to pregnant women, more research needs to be completed to determine how midwives can counsel women on dietary changes to reduce PPROM and preterm birth, especially if they have a previous history of preterm labor or delivery. Additional research could also compare dietary changes with conventional interventions to reduce the risk of preterm outcomes.

Carbohydrate Beverages

Oral intake of carbohydrates of varying types including orange juice, apple juice, grape juice, an energy drink, honey in water, and 30g protein drink was the topic of several studies (Ahadi et al., 2020; Ergol et al., 2012; Kardel et al., 2010; Rahmani et al., 2012; Sehhatie et al., 2017; Simonet et al., 2020; Taavoni et al., 2019; Vallejo et al., 2013). Research determined that oral carbohydrates decreased pain perception, labor duration, and increased satisfaction, without demonstrating adverse outcomes (Edwards et al., 2014; Simonet et al., 2020; Rahmani et al., 2012). Regarding ad lib intake, another study concluded that the addition of an energy drink did not affect labor duration; thus women do not need additional supplements beyond self-regulated intake (Kardel et al, 2010). Taavoni et al. (2019) determined a reduction in labor pain when women consumed honey. The addition of a protein drink to laboring women did not affect outcomes positively or negatively aside from an increase in patient satisfaction, with no adverse effects noted (Vallejo et al., 2013). While research is mixed regarding the benefit of carbohydrate beverages, in the absence of adverse outcomes related to their use women should have the freedom to drink as desired, since they may gain additional benefit. Women should have more control over their fluid intake as they utilize the right to self-determination and listen to their body's needs.

Adverse Outcomes

Current findings suggest that the risk of aspiration in low-risk women is almost nonexistent as demonstrated in the literature. Adverse outcomes, particularly maternal aspiration of stomach contents, are perhaps the primary concern surrounding the issue of eating during labor. Both ACOG and the ASA do not support solid food intake due to this potential risk. However, two studies demonstrated that among combined participants of 4,295 low-risk women,

no adverse outcomes occurred (Edwards et al., 2014; Simonet et al., 2020). A few of the studies selected for inclusion recorded whether adverse outcomes occurred including maternal aspiration, pulmonary edema, and perinatal mortality. One study allowed participants to self-regulate their oral fluid intake, while another gave participants juice to consume every three hours, with neither study finding any adverse outcomes as a result (Edwards et al., 2014; Simonet et al., 2020). In a similar study, no incidences of aspiration were noted when participants were given the choice between orange juice, date fruits, and unsweet tea (Rahmani et al., 2012). Perhaps most significantly, O'Sullivan et al. (2009) found no difference in maternal or neonatal outcomes when women were allowed to eat, along with no adverse effects. While there is a need for further research and continual reassessment of risk during the course of labor, research supports that a decision to eat and drink should be left to the woman's preference (Rahmani et al., 2012).

Trends and Gaps in Literature

During the course of gathering research, the majority of the recent articles dealt primarily with intravenous hydration. The lack of recent, strong evidence surrounding eating during labor was notable, with few articles allowing the ad lib oral intake of food or even fluids alone. This finding was unsurprising as it aligned with the current positions of ACOG and the ASA, both governing professional organizations that do not recommend solid intake during labor and at the most, allow women to drink clear fluids (ASA, 2016; ACNM, 2016). Notably those studies which evaluated solid food intake occurred outside of the United States.

While this literature review shows that low-risk nulliparous women can benefit from self-regulating oral intake, there has not been significant research displaying a more generalized

population of laboring women, including multigravida women. Positive correlations noted with oral intake for fluids, solids, and intravenous included shortening labor duration, reduction of pain, reduction in need for oxytocin induction or augmentation. Although positive outcomes were noted with oral intake, there were no negative outcomes noted even if positive outcomes were not discussed in the articles that there reviewed (Ahadi et al., 2020; Ahmed et al., 2018; Edwards et al (2014), Fong et al., 2017; Taavoni et al., 2019). Additionally, further comparison of oral intake and analgesia with labor outcomes would better help understand if there is any correlation that could affect maternal and fetal well-being. Research should be expanded to include women who are scheduled for induction given the potential risk of induction itself, along with the likelihood of a labor of extended duration.

Implications for Nurse-Midwifery Practice

Changes in policy and practice surrounding oral intake during labor have the potential to greatly improve maternal and neonatal outcomes, as well as improve patient satisfaction. With advances in obstetric and midwifery care including the ability to assess risks and anesthesia, it is time to reevaluate the policies and culture surrounding the consumption of food and drinks during labor and birth. Midwifery values a woman's right to self-determination and shared decision-making. By allowing women to eat and drink during labor, their physiological need to eat and drink as desired is honored and women are provided with the space to make those decisions for their own body's needs. Midwives offer a sacred space of safety and authenticity to low-risk laboring women and it is only appropriate to do so in an environment that also promotes adequate nutritional intake. Simultaneously, midwives embrace the art and science of midwifery as they partner with women through education and assessing the risk and benefits of oral intake. The Hallmarks of Midwifery that pertain to this theme include "Empowerment of women and

persons seeking midwifery care as partners in health care", "Advocating for informed choice, shared decision making, and the right to self-determination" and "Incorporation of evidence-based care into clinical practice" (ACNM, 2020, p.3). As well, the Pearl of Midwifery of "Allowing women to eat in early labor and drink throughout" remains significant in the face of ongoing restrictive intake policies (ACNM, 2019, p.101). Hence, creating a transparent partnership between the midwife and women by sharing evidence-based knowledge about eating and drinking during labor has beneficial implications for maternal and fetal wellbeing.

Application of Neuman Systems Model

The Neuman Systems Model conceptual framework looks closely at four systems: the client-client system, the environment, health, and nursing to better understand how interventions can be applied to move toward the continuum of health and wellness (Aylward, 2006). The framework of this model can be applied to the evaluation of hydration and nutrition to promote holistic wellness in laboring women. Essential mechanisms to enhance the flexible line of defense include the client-client system, the environment, and the health system (Angosta et al., 2014). As stated in Chapter One, it is vital that midwives begin having conversations and provide a discussion of the risks and benefits surrounding oral intake during prenatal visits. The strength of the line of resistance can also be impacted by a woman's cultural traditions of eating particular foods and drinks. Flexible lines of defense work to strengthen coping skills by reducing risk factors for stress and can be applied with the addition of specific foods shown to improve outcomes (Florczak et al., 2012).

Within the client-client system, these flexible lines of defense may be affected by lack of nutritional intake or dehydration. Research presented here shows that when restriction of oral intake occurs during labor, it leads to client feelings of fatigue, hunger, thirst, and dissatisfaction

with their labor experience and (Ozkan et al., 2017). The flexible line of defense can be strengthened in laboring women with the addition of certain specific dietary interventions such as juices, honey in water, and date fruits as they move towards holistic wellness, which is the ultimate goal of Neuman's Systems Model.

Recommendations for Future Research

While there is a wealth of research completed in the last ten years regarding intravenous hydration during labor, there remains a need for subsequent studies that include self-regulated dietary intake, as well as the implementation of specific foods to further draw out potential benefits. Future research must be completed with the aim of including more diverse populations and larger sample sizes in order to strengthen the findings and make them more generalizable to the greater population. As well, a comparison of nulliparous and multiparous scheduled inductions along with use of pain medications such as epidural, intravenous pain medications, and nitrous oxide would be beneficial. Other specific recommendations for research were incorporated in the literature synthesis.

Conclusion

This paper sought to determine what recent literature has reported about differences in maternal and neonatal outcomes when varying types of hydration and solid foods were given during labor. Chapter One presented a background of the issue including the statements of professional governing organizations. Chapter Two summarized the search process as the available literature was collected, carefully evaluated, and selected for inclusion or exclusion. Next, Chapter Three presented the findings of the chosen research articles. This final chapter synthesized the findings in order to present them clearly, to apply them to the practice question

and to nurse-midwifery practice as a whole. Neuman's Systems Theory provided a framework with which to guide the practice question towards the goal of holistic wellness in laboring women. To conclude, different types of oral and intravenous hydration, as well as certain foods, have been found to lead to favorable outcomes in mothers and their newborns, without adverse outcomes. Further research is necessary in order to more fully generalize the findings and ultimately work towards implementing change in typical practices in the obstetric world.

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Appendix I – Literature Review Matrix

<table>
<tr><td colspan="4">Source: Ahadi Yulghunlu, F., Sehhatie Shafaie, F., Mirghafourvand, M., & Mohaddesi, H. (2020). The effects of intravenous dextrose 5%, Ringer's solution, and oral intake on the duration of labor stages in nulliparous women: A double-blind, randomized, controlled trial. The Journal of Maternal-Fetal & Neonatal Medicine, 33(2), 289–296. https://doi.org/10.1080/14767058.2018.1489792</td></tr>
<tr><th>Purpose/Sample</th><th>Design (Method/Instruments)</th><th>Results</th><th>Strengths/Limitations</th></tr>
<tr><td>Purpose:
To determine the effect of different types of hydration on duration of total labor and labor stages, the frequency of oxytocin administration, and incidence of prolonged labor in women with spontaneous vaginal delivery.
Sample/Setting:
188 nulliparous low-risk women, at term gestation, in spontaneous labor and 4cm dilated.Conducted in Iran in 2016.
Level of evidence: Level I
Quality of evidence: Good</td><td>Double-blind, randomized, controlled trial.
Participants were randomized into three groups: the first receiving 125mL/hr Ringer’s solution with ad lib oral consumption of water, orange, or apple juice, the second receiving 125mL/hr of dextrose 5% solution with ad lib oral intake, and the third group consuming oral fluids only.</td><td>A significant difference between groups in overall labor duration ($p<0.001$), first stage ($p<0.001$), and third stage ($p<0.001$), with the dextrose 5% group having the shortest labor duration, first, and third stages.
A significant difference in oxytocin administration ($p<0.001$), and prolonged labor ($p=0.001$), with the dextrose 5% group having the lowest percentage for both.
Conclusion:
Dextrose IV fluid reduces the duration of labor, need for oxytocin augmentation, and frequency of prolonged labor compared to Ringer’s solution or oral fluids.</td><td>Strengths:
Double-blinded, randomized controlled trial decreases potential for bias and strengthens the findings. No significant demographic or obstetric differences between groups. Women received the same coaching for pushing during to add further control to the second stage duration. No epidural analgesia was administered to the participants.
Limitations:
Different physical abilities and physiological responses to contractions could have affected the duration of the second stage. Small sample size was small with strict inclusion criteria</td></tr>
<tr><td colspan="4">Author Recommendations: Dextrose intravenous fluid use by nulliparous women reduces the duration of labor, the need for oxytocin administration and the frequency of prolonged labor when compared to Ringer’s solution or oral fluids alone.</td></tr>
</table>

Summary for Current Clinical Practice Question: Dextrose 5% solution can be safely used in labor and leads to favorable results during labor for nulliparous women without epidural analgesia, including shorter duration of labor with less need for oxytocin augmentation.

Source: Ahmed, I. E., Mirghani, H. O., Mesaik, M. A., Ibrahim, Y. M., & Amin, T. Q. (2018). Effects of date fruit consumption on labour and vaginal delivery in Tabuk, KSA. *Journal of Taibah University Medical Sciences, 13*(6), 557-563. doi:10.1016/j.jtumed.2018.11.003

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To evaluate if consuming date fruits affect the onset and progress of labor. **Sample/Setting:** 89 participants including primigravida, multigravida, and grand multipara, who were admitted in labor. Conducted in King Fahd Specialty Civil Hospital, Tabuk KSA. **Level of evidence:** Level 1 **Quality of evidence:** Good	Randomized, controlled trial. Participants were divided into three cohorts. One group of participants (n=26) were given 7 Rotana dates followed by drinking 250cc of water. A second group of women (n=32), were only given dates. The control group (n=31) did not receive anything.	Women who consumed date fruits had a shorter first stage ($p=0.024$) and third stage ($p<0.001$) of labor. It was also noted that women were less likely to have meconium-stained fluids, caput, fetal heart variability, and better Apgar scores at 5min **Conclusion:** A positive correlation between date fruit consumption and duration of the first and third stages of labor progress. No statistical difference between the control group and the date-consuming group in cervical dilation, rupture of membranes, strength, frequency, and regularity in contractions.	**Strengths:** A randomized controlled trial. Dates are readily cheap and available. Consistent with cervical examinations and the use of tocometry. **Limitations:** Difficult to control participants' diets. Selected use of Rotana dates compared to other dates. The small sample size is thus challenging to generalize this study to the more significant population.
Author Recommendations: Further research is needed to further evaluate the exact amount of date fruit and the duration of date fruit consumption.			
Summary for Current Clinical Practice Question: Date fruit consumption during labor shortens the first and third stage of labor.			

Source: Direkvand-Moghadam, A., & Rezaeian, M. (2012). Increased intravenous hydration of nulliparas in labor. *International Journal of Gynaecology & Obstetrics.*, *118*(3), 213–215. https://doi.org/10.1016/j.ijgo.2012.03.041

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To compare the effects of intravenous fluids on labor length, need for oxytocin augmentation, and prolonged labor leading to adverse outcomes. **Sample/Setting:** 120 nulliparous women between 38-40 weeks gestation who were in spontaneous, active labor with a cervical dilation of 4-5cm. The study was conducted in Ilam Mustafa Hospital, Ilam, Iran. **Level of evidence:** Level I **Quality of evidence:** Good	A randomized controlled trial. Data was collected and analyzed using SPSS. A P value of less than 0.05 was considered statistically significant. Participants were assigned groups 1-4. Group 1 N=30 control group. Group 2-4 N=30 in each group received intravenous fluids at rates of 60mL/hr, 120mL/hr, and 240mL/hr. All participants were encouraged to drink water and soft drinks at will. Also, the participants did not have any labor anesthesia.	A compelling difference was noticed between the group active first stage of labor (p= 0.001). Also, the second stage of labor duration showed significant differences between the groups (p=0.01). There was no difference in the amount of oral fluids between the groups. **Conclusion:** Without restricting oral fluids and adding intravenous fluid administration in nulliparous women decreased labor duration, oxytocin augmentation, and reduced incidences of prolonged labor.	**Strengths:** A randomized controlled trial, which had therefore a low risk for bias. **Limitations:** The sample study in each group is too small to generalize the results. The restricted criteria of the study only focused on nulliparous women who were in active labor.

Author Recommendations: Intravenous fluids should be administered to nulliparous women in active labor. However, a larger cohort of participants is needed to generalize the results.

Summary for Current Clinical Practice Question: To decrease labor length, oxytocin augmentation, and prolonged labor for nulliparous women in active labor, they should receive intravenous fluids in addition to oral fluids.

Source: Edwards, R. K., Reed, C. A., Villano, K. S., Holmes, J. L., Suhong Tong, & Davies, J. K. (2014). Effect of hydration on spontaneous labor outcomes in nulliparous pregnant women: A multicenter randomized controlled trial comparing three methods. *American Journal of Perinatology, 31*(6), 455–461. doi: 10.1055/s-0033-1351661

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To evaluate the effect of mode and amount of fluid hydration on the course of labor, maternal and neonatal outcomes. **Sample/Setting:** 311 uncomplicated, full-term, nulliparous women in spontaneous labor, dilated to at least 2cm. 201 mother-infant pairs from Florida in 2003-2005, and 110 mother-infant pairs from Colorado in 2005-2011. **Level of evidence:** Level I **Quality of evidence:** High	A multi-center, randomized, controlled trial. Women were randomized into three groups, the first receiving intravenous hydration of lactated Ringer's solution with 5% dextrose (D5LR) at 125ml/hr with limited oral intake, the second receiving D5LR at 250mL/hr with limited oral intake, and the third receiving 25mL/hr of D5LR with ad lib oral intake of clear liquids.	There was not a significant difference between groups regarding duration of labor, rate of oxytocin augmentation, endometritis, wound complications, low neonatal APGARs, maternal fever, or proportion of women who had a cesarean delivery. The group receiving 25mL/hr of D5LR with ad lib oral intake had a significantly lower incidence of clinical chorioamnionitis (p=0.048). No reported instances of maternal aspiration, pulmonary edema, or perinatal mortality. **Conclusion:** While it appears to be safe, neither increased intravenous hydration nor oral hydration during labor improves labor performance according to these findings.	**Strengths:** Sample size was adequate in order to draw conclusions, and the randomization decreases the risk of bias. **Limitations:** Seven pairs of mothers and babies had missing data, three of which were in the intervention group and two women each in the other groups, and an additional 6 women withdrew from the study. Patients and care providers were not able to be blinded to the group allocations which may have introduced bias.

Author Recommendations: From the study findings as well as the literature reviewed, the authors concluded that increased hydration does not seem to hold promise as a way to prevent labor dystocia for nulliparous women in spontaneous labor.

Summary for Current Clinical Practice Question: Using different rates and formulations of IV hydration does not differ from oral hydration in preventing labor dystocia in nulliparous women. Oral intake of fluids during labor did not result in adverse outcomes.

Source: Ergol, S., Eroglu, K., & Taskin, L. (2012). The effect of oral fluid food support during labor on labor duration and perception of labor pains. *HealthMED, 6*(6), 2093-2099.

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To evaluate the effects of drinking oral fluids on labor and early postpartum outcomes. **Sample/Setting:** 110 low risk, term nulliparous women. Study was conducted in Women's Health Training and Research Hospital, Turkey. **Level of evidence:** Level I **Quality of evidence:** Good	A randomized controlled trial. N=55 in the intervention group consumed as much grape juice as desired as it was high in calories and low in volume 64Kcal/100mL and N=55 in the control group NPO status during labor. The visual analog scale (VAS) was used to evaluate pain. SPSS software is also used to obtain information. A P value of less than 0.05 was considered statistically significant.	The intervention group had a statistically significant reduction in labor length (p=0.016) compared to the control group. No significant difference was noticed with the first, second, and fourth stages of labor compared between both intervention and control groups. The participants in the intervention group experienced increased pain during labor compared to the control group. However, it's not statistically significant. **Conclusion:** Allowing low-risk women oral intake during labor shortens labor duration but does not affect the perception of pain.	**Strengths:** A randomized controlled trial, therefore with low risk for bias. Oral liquids were easily accessible to participants and there was consistent tracking of participants' oral intake. **Limitations:** Small samples and only focused on nulliparous women; thus, difficulty with generalizing the results.

Author Recommendations: More studies would need to be conducted to assess the maternal and neonatal outcomes of oral intake during labor. Allowing oral intake shortens labor duration, however perception of pain is unchanged.

Summary for Current Clinical Practice Question: Low-risk women who are allowed oral intake during labor may have a shorter labor duration.

Source: Fong, A., Serra, A. E., Caballero, D., Garite, T. J., & Shrivastava, V. K. (2017). A randomized, double-blinded, controlled trial of the effects on fluid rate and/or presence of dextrose intravenous fluids on the labor course of nulliparas. *American Journal of Obstetrics & Gynecology,* 208, 1-7. http://dx.doi.org/10.1016/j.ajog.2017.03.010.

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To examine if prolonged labor is decreased by the rate of intravenous fluid given during labor or the type of intravenous fluid administered. **Sample/Setting:** 274 nulliparous women with singleton gestion in active labor with cephalic presentation. Conducted in California between 2012-2014. **Level of evidence:** Level I **Quality of evidence:** Good	Double-blinded, randomized, controlled trial from April 2012-March 2014. Using computer generated randomization participants were divided into 1 of 3 groups. Group1: Normal saline running at 250mL/hr(N=92) Group 2: 5% dextrose in NS running at 125mL/hr (N=92) Group 3: 5% dextrose in NS running at 250mL/hr (N=90).	There was no compelling difference in the outcome of labor length and no statistical difference among the three groups. **Conclusion:** When it comes to potentially decreasing prolonged labor in singleton nulliparous women increasing intravenous fluids or the type of fluid administered did not affect labor outcomes.	**Strengths:** A randomized controlled trial, therefore low risk for bias **Limitations:** Larger sample size in each group is needed to determine if the length of labor is decreased with fluids. There was also no indication of participants' hydration status or measurements of additional oral intake by participants.

Author Recommendations: A larger cohort of participants is needed to evaluate increasing intravenous fluids vs oral intake and/or oral fluids that contain dextrose, as the study did not see a change in labor outcomes with different fluid rates.

Summary for Current Clinical Practice Question: Neither increasing intravenous fluid nor the type of fluids has any effect on labor outcomes for nulliparous women.

Source: Garmi, G., Zuarez-Easton, S., Zafran, N., Ohel, I., Berkovich, I., & Salim, R. (2017). The effect of type and volume of fluid hydration on labor duration of nulliparous women: A randomized controlled trial. *Archives of Gynecology and Obstetrics*, *295*(6), 1407–1412. https://doi.org/10.1007/s00404-017-4381-1

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: Determine whether the type of parenteral fluids and the rate of administration affects the duration of labor. The secondary outcome studied incidence of oxytocin augmentation, intrapartum fever, length of the second stage, mode of delivery, and postpartum hemorrhage. **Sample/Setting:** 300 nulliparous women at term gestation with a cervical dilation of at least 1cm dilation. The study was done in Afula, Israel. **Level of evidence:** Level I **Quality of evidence:** Good	A randomized controlled trial was done by using a computer randomization sequence generation program. Data and categorized and analyzed by using Fisher's exact test and ANOVA. Statistical analysis used included SAS with a P value of less than 0.05 considered statistically significant. Group 1 N=101 received ringers fluids at 125mL/hr. Group 2 N= 101 received ringers fluids at 250mL/hr, and Group 3 N=98 was administered normal saline with 5% dextrose at 125mL/hr. All participants were allowed to freely take ice chips, drinking water, or tea with sugar.	There was no significant difference between the groups in prolonged labor (p=0.74), second stage of labor (p=0.73), oxytocin administration (p=0.89), mode of delivery (p=0.21), intrapartum fever (p=0.08), and early postpartum hemorrhage (p=0.74). **Conclusion:** When comparing different parenteral fluids and different rate administration there was no positive outcome in the duration of labor, or secondary outcomes as discussed earlier.	**Strengths:** A randomized controlled trial. **Limitations:** Confounding variable to keep track of specifically secondary outcomes of the study. No evidence of tracking oral intake thus difficult to evaluate exact oral intake by participants. In addition to the studies small sample size, the study was limited to healthy nulliparous women as well. Hence the results of the study are not generalizable.

Author Recommendations: Further studies are needed with more inclusive participants from the general population on the effects of increasing hydration and adding dextrose fluids intravenously.

Summary for Current Clinical Practice Question: Increasing the rate of parenteral fluids and adding dextrose did not impact the duration of labor for nulliparous women.

Source: Kardel, K. R., Henriksen, T., & Iversen, P. O. (2010). No effect of energy supply during childbirth on delivery outcomes in nulliparous women: A randomised, double-blind, placebo-controlled trial. *Journal of Obstetrics and Gynaecology: The Journal of the Institute of Obstetrics and Gynaecology, 30*(3), 248–252. doi:10.3109/01443610903531428

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To examine whether an additional energy drink beyond a self-regulated dietary intake during labour would shorten duration of labour in nulliparous women. **Sample/Setting:** 213 low-risk, nulliparous women at >36 weeks gestation with uncomplicated, singleton pregnancies. Conducted in Norway in 2006-2008. **Level of evidence:** Level I **Quality of evidence:** High	Double-blind, randomized controlled trial. Participants were divided into two groups; the intervention group received 1 liter of isotonic energy drink while the control group received 1 liter of placebo-drink at the start of labor. Both groups were permitted to self-regulate their dietary intake, which was the standard of care, however the assigned drink was consumed first.	Extra oral energy from the drink did not have a significant effect on total time spent in childbirth among healthy nulliparous women (p=0.68), nor were there differences in durations of the first and second stages of labour between groups. Energy drink had no significant effect on the use of epidural anaesthesia, use of contraction stimulating measures (oxytocin and/or amniotomy), percentage of instrumental vaginal deliveries, and rate of caesarean sections or Apgar score. **Conclusion:** The study concluded that extra energy supply during labour in the form of an energy drink did not affect the duration of labour in healthy nulliparous women.	**Strengths:** Double-blinded RCT, with sufficient sample size as calculated by statistical analysis and sufficient power to test several outcomes. **Limitations:** The study included low-risk, nulliparous women at a single site in Norway, which limits generalization to women with complicated pregnancies or those in lower-income areas.

Author Recommendations: The present study's findings do not support a general policy of offering labouring women in affluent societies extra energy beyond a self-regulated intake. The possible effect of maternal nutritional status on energy needs during labour warrants further investigation.

Summary for Current Clinical Practice Question: Giving women an energy drink at the onset of labor does not affect duration of labor in healthy, nulliparous women. Low-risk nulliparous women should be allowed to self-regulate their food and drink intake.

Source: Kavitha, A., Chacko, K. P., Thomas, E., Rathore, S., Christoper, S., Biswas, B., & Mathews, J. E. (2011). A randomized controlled trial to study the effect of IV hydration on the duration of labor in nulliparous women. *Archives of Gynecology and Obstetrics, 285*(2), 343-346. doi:10.1007/s00404-011-1978-7

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To compare the effects of two different regimens of intravenous hydration and oral hydration on the duration of active labor. **Sample/Setting:** 293 low-risk, term primigravida with singleton pregnancies in spontaneous active labor. Conducted in South India in 2007-2008 and in 2011. **Level of evidence:** Level I **Quality of evidence:** Good	Randomized controlled trial. Participants were randomized into three groups: the first group (n=99) received oral fluids (water and coconut water) only, the second group (n=98) received Ringer lactate at 125mL/hr, and the third group (n=96) received Ringer lactate at 250mL/hr. The intravenous groups were allowed oral fluid intake as desired.	There was not a significant difference in labor duration, prolonged labor, mode of delivery, maternal or neonatal outcomes, or oxytocin requirement between groups. A significant decrease in the incidence of vomiting was noted in the intravenous groups (p=0.001). **Conclusion:** There is a decrease in vomiting with intravenous hydration compared to oral fluids alone.	**Strengths:** Randomized, controlled trial with demographic similarities across groups. **Limitations:** Sample size was smaller, and may have been inadequate to see significant differences as seen in other randomized controlled trials.

Author Recommendations: Intravenous hydration is an important factor that merits further study when studying factors that influence duration of labor.

Summary for Current Clinical Practice Question: Intravenous hydration, in addition to oral intake, in low-risk primigravida can decrease vomiting during labor when compared to water or coconut water alone.

Source: Kordi, M., Meybodi, F. A., Tara, F., Fakari, F. R., Nemati, M., & Shakeri, M. (2017). Effect of dates in late pregnancy on the duration of labor in nulliparous women. *Iranian Journal of Nursing and Midwifery Research*, *22*(5), 383–387. Doi: 10.4103/ijnmr.IJNMR_213_15

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To see the effects of date consumption on labor progress in nulliparous women. **Sample/Setting:** 182 nulliparous women aged 18-35 who were 37-38 weeks gestation. Study was conducted in OmAlBanin Hospital in Mashhad, Iran. **Level of evidence:** Level I **Quality of evidence:** Good	A randomized clinical trial. Participants were placed in two groups; the intervention group (n= 91) were provided with 70-75g or 6-7 dates starting at 37 weeks to consume daily. The second group (n= 91) functioned as the control. SPSS was used to decode and analyze the information. A P=0.05 considered to statistically significant.	Statistically significant differences noted between the intervention group and the control group in spontaneous labor, particularly the active phase of labor (p=0.0001) second stage (p=0.0001) and the third stage of labor (p=0.004) and the need for oxytocin augmentation (p<0.001). No significant difference noticed with labor induction in the active, second, and third stages of labor. **Conclusion**: Nulliparous women who consumed dates in the late third trimester had shorter labor length when spontaneous labor occurred.	**Strengths:** A randomized controlled trial. A natural fruit used to shorten labor length in nulliparous women. **Limitations:** A small sample size, which only included nulliparous women and excluding multiparous women. Difficult to control the exact amount of dates consumed by the participants.

Author Recommendations: Nulliparous women with no contraindications should consume dates in the late third trimester. However, further research is needed in the exact amount of dates that need to be consumed.

Summary for Current Clinical Practice Question: Consuming dates beginning at 37-28 weeks can shorten labor length and decrease the need for labor augmentation in nulliparous women.

Source: O'Sullivan, G., Liu, B., Hart, D., Seed, P., Shennan, A. (2009). Effect of food intake during labour on obstetric outcome: Randomised controlled trial. *BMJ: British Medical Journal*, 338. doi:10.1136/bmj.b784

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: The purpose of this study was to determine if oral intake of food would impact a normal vaginal delivery, length of labor, or neonatal outcomes **Sample/Setting:** 2426 nulliparous adult women at 36 weeks gestation or greater. The study was conducted in London between 2001-2006. **Level of evidence:** Level 1 **Quality of evidence:** Good	Perspective randomized, controlled trial. Group one: N=1219 eating group that can consume low fat, low-residue diet and water. Group two: N=1207 ice chips and water only. Vaginal exams evaluated every four hours with continuous external fetal heart monitoring and tocodynamometry.	There was no significant difference between the two groups regarding mode of delivery, length of labor or neonatal outcomes. 44% delivered vaginally from the eating group and 44% delivered vaginally (P=0.77). Geometric mean for labor length in the eating group was 597 minutes compared to 612 minutes in the water group (P=0.975). Lastly no significant difference noted with five minute Apgars of under 7 (p=0.33) along with neonatal admissions to intensive care units (p=81). **Conclusion:** Eating during labor does not affect labor or neonatal outcomes, nor are there adverse effects on withholding food.	**Strengths:** A randomized controlled trial. Different variables considered with vaginal delivery outcomes, labor length, and neonatal outcomes. Adequate sample size. **Limitations:** The study was limited to nulliparous women, therefore not applicable to other pregnant women. The study's validity is questionable as 29% of the eating group participants didn't consume any food, and 20% of the water-only group consumed food.

Author Recommendations: Low-risk first-time mothers had no change in maternal or fetal outcomes whether they were allowed to eat or just drink water. However further research needs to be done including multiparous mothers to get a generalized representation.

Summary for Current Clinical Practice Question: No harm nor benefit was noted when low-risk, first-time mothers ate or drank during labor. There were also no differences in labor and neonatal outcomes as well. Women should be allowed to eat or drink if desired.

Source: Paré, J., Pasquier, J., Lewin, A., Fraser, W., & Bureau, Y. (2017). Reduction of total labour length through the addition of parenteral dextrose solution in induction of labor in nulliparous: Results of DEXTRONS prospective randomized controlled trial. *American Journal of Obstetrics and Gynecology*, *216*(1), S23–S24. https://doi.org/10.1016/j.ajog.2016.11.924

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To determine whether administering intravenous dextrose fluids could decrease the labor length for induced nulliparous women, and also to see the effect on length of active phase in the second stage, delivery route, Apgars scores, and arterial cord pH. **Sample/Setting:** 193 nulliparous women at term with a Bishop score >6. Conducted at a French hospital between January 2013- March 2016. **Level of evidence:** Level I **Quality of evidence:** Good	Prospective double-blind randomized controlled trial Randomization was done by using computer-generated randomization. Following informed consent, patients were randomized to either receive normal saline (n=97) or normal saline with 5% dextrose (n=96) at 250ml/hr along with oxytocin induction. Statistical analyses of SAS 9.4 and SPSS were used. Along with Kaplan-Meier survival analysis. Statistical significance was characterized as $P < .05$.	First, second, and third stage of labor was significantly shorter with normal saline with 5% dextrose fluid P=.024. Along with the combination of first and second stage of labor P=.020 not either stage independently. No significant difference in mode of delivery, Apgars scores or arterial cord pH. **Conclusion:** Intravenous dextrose fluids do not increase the risk of cesarean or operative delivery. Dextrose fluids significantly decrease the length of labor induction in nulliparous women.	**Strengths:** Double-blind randomized controlled design. Persuasive and dependable in comparison to other similar studies. **Limitations:** Study focused on nulliparous women with favorable cervix excluding multiparous women and women with unfavorable cervix thus not generalizable. Other outcomes and conditions of neonatal aspects weren't considered.

Author Recommendations: Intravenous dextrose fluid should be administered to laboring nulliparous women for induction.

Summary for Current Clinical Practice Question: Intravenous dextrose fluid administration for nulliparous women decreases the total duration of labor during induction, without increasing risk of cesarean or operative delivery.

Source: Rahmani, R., Khakbazan, Z., Yavari, P., Granmayeh, M., & Yavari, L. (2012). Effect of oral carbohydrate intake on labor progress: Randomized controlled trial. *Iranian Journal of Public Health, 41*(11), 59–66. https://ijph.tums.ac.ir/index.php/ijph.

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To explore the effectiveness of oral carbohydrate intake during labor on the duration of the active phase and other maternal and neonatal outcomes. **Sample/Setting:** 177 low-risk women who were over 19 years of age, ≥36 weeks gestation, with a cephalic, singleton pregnancy and cervical dilation of 3-4cm. Conducted in Iran in 2008. **Level of evidence:** Level 1 **Quality of evidence:** Good	Parallel, prospective randomized, controlled trial. Participants were randomized to their group each day. The intervention group was given the choice between 3 medium dates plus 110 ml water; 3 dates plus 110 ml light tea without sugar; or 110 ml orange juice, to consume during the active stage of labor, while the control group fasted as the routine practice. No epidural analgesia was used at the facility.	The length of the second stage of labor was significantly shorter in the carbohydrate group ($p<0.05$). However, there was no significant difference between groups in the active or third stage of labor, type of delivery, frequency/volume of vomiting, neonatal heart rate and Apgars, instrumental delivery, or cesarean. No incidences of aspiration were reported. **Conclusion:** In the case of low-risk women with 3-4 cm cervical dilation, consuming dates or orange juice during active labor could decrease the length of the second stage of labor phase.	**Strengths:** Randomized, controlled trial, which was reproducible. Content of the data questionnaires was validated by 10 expert professionals. Baseline characteristics were similar between groups, therefore the intervention was responsible for the differences noted. **Limitations:** The main researcher was responsible for all data, and was therefore not blinded to group allocation. Recruitment of women at different stages of dilation might have affected labor duration and shown different results.

Author Recommendations: Oral intake of carbohydrates can effectively shorten the duration of second stage of labor in low-risk women, with no significant difference between oral intake and other maternal and neonatal outcomes.

Summary for Current Clinical Practice Question: Women should be notified of the potential risks and benefits regarding eating and drinking during labor, and the final decision should be left to the woman's preference. Consuming date fruits or orange juice may shorten the second stage of labor in low-risk women 3-4cm dilated.

Source: Razali, N., Mohd Nahwari, S. H., Sulaiman, S., & Hassan, J. (2017). Date fruit consumption at term: Effect on length of gestation, labour and delivery. *Journal of Obstetrics and Gynaecology : The Journal of the Institute of Obstetrics and Gynaecology, 37*(5), 595–600. https://doi.org/10.1080/01443615.2017.1283304

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To evaluate if consuming dates lowers the need for labor augmentation. **Sample/Setting:** 154 primiparous, low-risk women. Conducted at University Malaya Medical Center in Malaysia from November 2013- July 2014 **Level of evidence:** Level I **Quality of evidence:** Good	A randomized controlled trial. 77 women were placed in the control group and 77 women were placed in the intervention group. The intervention group consumed 7 dates daily beginning at 37 weeks gestation until onset of labor. All participants were primiparous women who were on average 37 weeks gestation with no chronic illness or antenatal complications. SPSS 20 statistical software was used. A P value of less than .05 was considered statistically significant.	The likelihood of requiring oxytocin augmentation was less in the date consuming group (p=.04). No significant difference noted between the groups in an increase in cervical dilation. **Conclusion:** Consuming dates in the late third trimesters can increase the likelihood of spontaneous labor and decrease the need for induction and augmentation of labor.	**Strengths:** A randomized controlled trial with low risk for selection bias. **Limitations:** A small sample and only primiparous women were included in this study. Therefore unable to generalize to the general population of pregnant women. It was challenging to say the exact amount of dates that should be consumed to have a positive result.

Author Recommendations: Consuming dates can increase likelihood of spontaneous labour and decrease need for induction or augmentation, however further research is needed to evaluate the exact amount of required dates.

Summary for Current Clinical Practice Question: Consuming dates in the late third trimesters could be considered to avoid oxytocin or prostaglandin usage during labor and to increase the likelihood of spontaneous labor.

Source: Sehhatie Shafaie, F., Mohaddesi, H., Mirghafourvand, M., & Ahadi Yulghunlu, F. (2017). A randomized, double-blinded, controlled trial comparing parenteral dextrose 5%, Ringer's solution and oral intake on the delivery outcomes in nulliparas. *International Journal of Women's Health and Reproduction Sciences, 5*(4), 283–289. https://doi.org/10.15296/ijwhr.2017.48

Purpose/Sample	**Design (Method/Instruments)**	**Results**	**Strengths/Limitations**
Purpose: To evaluate labor outcomes such as mode of delivery, need for oxytocin, and prolonged labor when Ringer's fluids, dextrose fluids or oral intake of fluids are administered to nulliparous women in labor. **Sample/Setting:** 201 low-risk, full-term, nulliparous women. Conducted in Iran from March- October 2016. **Level of evidence:** Level I **Quality of evidence:** High	Double-blind randomized controlled trial. Participants who were admitted in spontaneous labor and at least 4cm dilated were divided into three groups. Group one received Ringer's solution in addition to oral fluids (water, apple juice or orange juice). Group two received dextrose 5% plus oral fluids. Group three received only oral fluids. SPSS version 21.0 was used to analyse data. Statistical significance was established as $P < 0.05$.	There was a statistically significant difference in mode of delivery ($p=0.002$) with the dextrose group having the fewest cesarean deliveries. There was a significant difference between groups in rates of oxytocin augmentation ($p=0.001$) and prolonged labor ($p=0.001$) with dextrose having the least incidence of both. Also, one minute Apgars between the Ringer's group and dextrose group ($P=0.004$) were significant. **Conclusion:** Dextrose, 5% fluid, has been shown to give considerable benefits of lower cesarean delivery, oxytocin augmentation, decreased prolonged labor, and one-minute Apgars.	**Strengths:** A double-blind randomized controlled design. **Limitations:** The study only looked at nulliparous women which decreases generalization. The dependent variable was challenging to control with the variability of the second stage of labor and administration of oxytocin. Cervical response to oxytocin or spontaneous labor and the pelvic shape and soft tissues are diverse and challenging to control.

Author Recommendations: The full and diverse physiological differences are difficult to control, thus requiring further evaluation of pushing management in the second stage of labor and the administration times of oxytocin with larger more inclusive sample.

Summary for Current Clinical Practice Question: Dextrose 5% solution led to more favorable results during labor (fewer cesareans, prolonged labors, and oxytocin augmentation) compared to the Ringer's solution and oral fluids and can be safely used in labor.

Source: Sharma, C., Kalra, J., Bagga, R., & Kumar, P. (2012). A randomized controlled trial comparing parenteral normal saline with and without 5% dextrose on the course of labor in nulliparous women. *Archives of Gynecology and Obstetrics, 286*(6), 1425–1430. https://doi.org/10.1007/s00404-012-2485-1

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To assess if the initiation of parenteral fluids have an impact on labor outcomes in nulliparous women who are in active labor. Secondary aim was vaginal delivery, spontaneous, operative, prolonged labor, oxytocin use, initial cervical dilation, and chorioamnionitis. **Sample/Setting:** 250 nulliparous women. Conducted at Nehru Hospital in Chandigarh, India. **Level of evidence:** Level 1 **Quality of evidence:** Good	A randomized controlled trial. Data was organized by Fisher exact test and analyzed variables using Kruskal-Wallis. A P value of less than 0.05 was considered statistically significant. N=122 women were administered 5% dextrose alternating normal saline fluids infused at 175mL/hr. While the control group only received normal saline fluids also infused at 175mL/hr.	A highly statistically significant difference was recognized in labor duration between the intervention group and the control group (p=0.000). A compelling difference was a note in prolonged labor (p= 0.009) and augmentation with oxytocin (p=0.004). Initial cervical dilation and chorioamnionitis were comparable, and there was no significant difference in the mode of delivery. **Conclusion:** The administration of parenteral fluid dextrose 5% alternating with normal saline decreases labor length, reduces the incidence of prolonged labor, and the need for oxytocin augmentation.	**Strengths:** A randomized controlled trial. Adequate sample size to obtain positive results. **Limitations:** The study focused on uncomplicated nulliparous in spontaneous active labor women, thus excluding other nulliparous low-risk women who weren't in active labor and multiparous women. Therefore this study cannot be generalized.

Author Recommendations: More research is needed to explore other variables and the incidence of cesarean birth despite parenteral fluids.

Summary for Current Clinical Practice Question: For nulliparous women in active labor, there is a greater benefit with administering dextrose 5% fluids alternated with normal saline in order to reduce chances of oxytocin augmentation and prolonged labor.

Source: Shrivastava, V.K., Garite, T.J., Jenkins, S.M., Saul, L., Rumney, P., Preslicka, C., & Chan, K. (2009). A randomized, double-blinded, controlled trial comparing parenteral normal saline with and without dextrose on the course of labor in nulliparas. *American Journal of Obstetrics & Gynecology*, *200*(4), 379.e1-6. Doi: 10.1016/j.ajog.2008.11.030

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To compare intravenous normal saline with and without dextrose on the course of labor in nulliparous women. **Sample/Setting:** 289 nulliparous, women in spontaneous, active labor with uncomplicated singleton pregnancies. Conducted in California between 2001-2007. **Level of evidence:** Level I **Quality of evidence:** High	Double-blind, prospective, randomized controlled trial. Participants were randomized into three groups: the first/control group receiving normal saline, the second group receiving normal saline with 5% dextrose, and the third group received normal saline with 10% dextrose. All participants received the intravenous fluids at 125mL/hr and were permitted nothing by mouth except ice chips.	Participants who received dextrose (5% or 10%) completed labor significantly faster, on average, than those treated with normal saline (p=.02), and had shorter second stages (p=0.01) and fewer prolonged labors (p=0.01). There was not a significant difference in time from fluid initiation to complete dilation. No significant difference when comparing the two dextrose concentrations (p=0.95). **Conclusion:** The administration of a dextrose solution, regardless of concentration, was associated with a shortened labor course in term vaginally delivered subjects in active labor.	**Strengths:** Both participants and researchers were blinded to group allocation, and it was a randomized controlled trial. As well, the letter (A, B, C) associated with each fluid type was randomized every 80 patients to minimize observer bias. Sample size was sufficient to have a high enough power to detect differences. Groups were similar demographically. **Limitations:** Results can only be generalized to low-risk, nulliparous women in spontaneous labor, and the study was only completed at one site and over a long period of time.

Author Recommendations: Additional research is needed to further determine labor management focused on not only optimizing the course of labor but also improving rates of successful vaginal delivery.

Summary for Current Clinical Practice Question: The duration of labor course and frequency of prolonged labor in nulliparous women can be improved by the intravenous administration of dextrose.

Source: Simonet, T., Gakuba, C., Desmeulles, I., Corouge, J., Beucher, G., Morello, R., Gérard, J. L., Ducloy-Bouthors, A. S., Dreyfus, M., & Hanouz, J. L. (2020). Effect of oral carbohydrate intake during labor on the rate of instrumental vaginal delivery: A multicenter, randomized controlled trial. *Anesthesia and analgesia, 130*(6), 1670–1677. doi: 10.1213/ANE.0000000000004515

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To determine whether carbohydrate intake during labor could decrease the rate of instrumental vaginal delivery, along with its effect on duration of labor, mode of delivery, self-reported evaluation of maternal well-being, breastfeeding success, vomiting, and length of hospitalization. **Sample/Setting:** 3,984 low-risk women presenting at > 35 weeks gestation and < 8cm dilated in spontaneous labor. Conducted at 3 French hospitals from 2008-2012. **Level of evidence:** Level I **Quality of evidence:** High	Multicenter, prospective, randomized, controlled trial. Eligible women were randomized into two groups: the Carbohydrate group was advised to drink 200mL of apple or grape juice every 3 hours, along with water, while the Fasting group was only permitted to consume water. Both groups received the stand of care which included intravenous fluids containing 5% glucose, sodium, and potassium at 60mL/hr.	There was no significant difference between groups in the rate of instrumental vaginal delivery (p=0.35). There were also no significant differences in the secondary outcomes examined including overall mode of delivery, duration of labor, maternal well-being, vomiting, breastfeeding, or length of hospitalization. **Conclusion:** Allowing low-risk women to drink fruit juice during labor did not modify the risk of instrumental vaginal delivery, nor affect other outcomes.	**Strengths:** This study had a large sample size across three locations. Randomization was present, and the attending obstetricians who made decisions regarding labor course were blinded to the study protocol, therefore removing bias. **Limitations:** Only 14% perfectly adhered to the carbohydrate protocol, thus findings were limited by high rates of crossover. Exclusion of high-risk women limits generalizability. A higher rate of instrumental delivery occurred than predicted, which raised the power required to detect a significant difference, and changes in obstetric practice may have occurred.

Author Recommendations: Advising fruit juice intake with water during labor did not modify the rate of instrumental delivery.

Summary for Current Clinical Practice Question: Allowing low-risk women to consume water and fruit juices during labor does not increase the risk of instrumental vaginal delivery, nor does it significantly impact mode of delivery, duration of labor, occurrence of vomiting, maternal hunger, thirst, fatigue, anxiety, or length of hospital stay.

Source: Taavoni, S., Fathi, L., Nazem-Ekbatani, N., & Haghani, H. (2019). The effect of oral intake of honey syrup on the pain intensity of active phase of parturition of nulliparous women: A randomized clinical trial. *Caspian Journal of Internal Medicine, 10*(1), 98–101. https://doi.org/10.22088/cjim.10.1.98

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To determine the effect of honey supplementation during labor on the severity of labor pain in primigravida women. **Sample/Setting:** 80 primigravida women with low-risk, full-term pregnancies who were 4-7cm dilated. Conducted in Iran in 2015. **Level of evidence:** Level I **Quality of evidence:** Good	Double-blinded, randomized controlled trial. Participants were randomized to two groups; the first group received 2.5 teaspoons of honey in 150mL water at the beginning of the study and then every 30-60 minutes, and the second (control) group received 150mL of water. Pain scores were recorded by the women using a 0-10 scale, every 30 minutes until 8cm dilated.	The intervention group reported significantly decreased pain, at 30 minutes (p=0.028), 60 minutes (p=0.000), 90 minutes (p=0.003) and at 120 minutes post-intervention (p=0.022). **Conclusion:** The authors concluded that in low-risk, term primigravida women, honey consumption significantly reduced labor pain.	**Strengths:** Participants and researchers were blinded to group assignments, and randomized. Sample size was adequate for statistical analysis. **Limitations:** Relatively small sample size along with single site and narrow demographics limit generalization. It was noted that noise and crowding in the labor room may have influenced pain perception, so participants were placed in an independent unit of the labor wing.

Author Recommendations: Due to the limited resources and contradictory results from existing research, further studies seem necessary in this field. Honey consumption significantly reduces labor pain in primigravid women.

Summary for Current Clinical Practice Question: Honey in a small amount of water can significantly decrease labor pain in low-risk, primigravida women when compared to water alone.

Source: Vallejo, M. C., Cobb, B. T., Steen, T. L., Singh, S., & Phelps, A. L. (2013). Maternal outcomes in women supplemented with a high-protein drink in labour. *The Australian & New Zealand Journal of Obstetrics & Gynaecology, 53*(4), 369–374. https://doi.org/10.1111/ajo.12079

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To evaluate the incidence of nausea, emesis and overall patient satisfaction with their birthing experience after the addition of a high-protein drink during labour in women with epidural analgesia. Also the rate of gastric emptying with ultrasound in women who have ingested a high-protein drink. **Sample/Setting:** 150 women at ≥36 weeks gestation, with a singleton vertex pregnancy. Conducted in Pennsylvania, USA in 2010–2012. **Level of evidence:** Level I **Quality of evidence:** Good	Prospective, randomized, controlled trial. Participants who were ≤5cm dilated at the time of epidural placement, and who had been NPO for 4 hours before epidural placement were randomized into two groups, with the intervention group (n=75) receiving a 325mL drink containing 30g protein to consume within 15 minutes, along with ice chips and water, and the control group (n=75) receiving only ice chips and water. Patients reported pain, nausea, and emesis on an hourly basis, and gastric emptying was measured by ultrasound.	There was not a significant difference between groups in incidence of nausea and vomiting, neonatal Apgars at 1 and 5 minutes, or mode of delivery. There was a significant difference relating to patient satisfaction with the protein drink group being more satisfied (p=0.007). **Conclusion:** Patient satisfaction is improved with high-protein drink supplementation compared with ice chips/water with comparable gastric emptying rates for both groups (p=.19)	**Strengths:** The study design was strong and reproducible as a randomized controlled trial. The sample size was adequate as calculated to determine significance. **Limitations:** The study only included women with epidurals which limits generalization. 12 women were unable to consume the drink in the allotted time and were excluded.

Author Recommendations: The high-protein drink provided benefits without negative consequences in this study therefore, a more liberal oral intake policy may be considered in women who are at low risk of complications and lack comorbidities.

Summary for current clinical practice question: The high-protein drink increased satisfaction among women without increasing adverse events such as nausea or vomiting or delayed gastric emptying.

Source: Al-Kuran, O., Al-Mehaisen, L., Bawadi, H., Beitawi, S., & Amarin, Z. (2011). The effect of late pregnancy consumption of date fruit on labour and delivery. *J Obstet Gynaecol*, *31*(1), 29–31. https://doi.org/10.3109/01443615.2010.522267

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To examine the effect of oral consumption of date fruit before the onset of labor on delivery outcomes. **Sample/Setting:** 114 nulliparous and primigravida women at 36 weeks of gestation with no medical or antenatal complications. Conducted in Jordan between 2007-2008. **Level of evidence:** Level III **Quality of evidence:** Good	A prospective study. Date collected and analyzed using SPSS and Fisher exact test. A p-value of less than 0.05 was considered significant. Group 1 (n= 69) consumed 6 dates per day from 36 weeks gestation until labor onset. Group 2 (n=45), as a control, was instructed not to consume any dates in the late third trimester.	Admission cervical dilation was significantly higher in date consuming participants than non-date consuming group (p= 0.0005). Also, the first (p=0.05), second (p=0.05), and third (p=0.05) stages of labor were statistically significant between the two groups, with the date consuming participants having less mean average on the length of labor in each stage. Additionally a significant difference in intact membrane (p= 0.007), onset of spontaneous labor (p=0.024), need for oxytocin augmentation/need for induction (p=0.036) and cesarean birth (p=0.05) between the groups. **Conclusion:** The consumption of dates reduces the duration of labor and the need for induction/oxytocin augmentation.	**Strengths:** This study was an insightful study with transparency in data collection. **Limitations:** A small sample study. The study's validity is questionable due to the difficulties in obtaining the control group due to the cultural consumption of dates during pregnancy. The study is limited to only nulliparous primigravida women, so less generalizable. No randomization as women chose their groups.

Author Recommendations: Further research is needed to determine how the number of dates consumed has on the effects of the outcome. Also, to the length of time, date fruits should be consumed.

Summary for Current Clinical Practice Question: Consuming date fruit reduces the need for labor augmentation and improves labor outcomes.

Source: Myhre, R., Brantsæter, A., Myking, S., Eggesbø, M., Meltzer, H., Haugen, M., & Jacobsson, B. (2013). Intake of garlic and dried fruits is associated with lower risk of spontaneous preterm delivery. *Journal Of Nutrition, 143*(7), 1100–1108. doi: 10.3945/jn.112.173229

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To determine the influence of food with antimicrobial and prebiotic components on the risk of spontaneous preterm delivery (PTD). **Sample/Setting:** 18,888 pregnant women, of which 950 had uncomplicated pregnancies with spontaneous PTD between 22-36 weeks gestation. **Level of evidence:** Level III **Quality of evidence:** Good	Prospective cohort study Data was collected from the Norwegian Mother and Child Cohort Study between 1999-2008. 18,888 women were eligible and completed both the questionnaires and food reports for this study. 950 women had spontaneous PTD while the remaining 17,938 women who delivered at term served as the control group.	Alliums (garlic, onion, leek, and spring onion) and dried fruits (raisins, apricots, prunes, figs, and dates) were associated with reduced risk of spontaneous PTD (p=0.005 for both). Garlic had the strongest association of the alliums (p=0.011) while raisins were the strongest association of dried fruits (p=0.017). There was also a significant association between PPROM and raisins (p=0.008) with raisins reducing the risk of PPROM. **Conclusion:** Garlic is associated with overall reduced risk of spontaneous PTD, whereas raisins mainly are associated with lowered risk of PPROM.	**Strengths:** Large sample size cohort, and demographic similarities between groups to strengthen findings. Sample size was adequate to adjust for many maternal and fetal factors. **Limitations:** Participation in the cohort study was 38% which may contribute selection bias. The cohort had higher proportions of nonsmokers and greater education.
Author Recommendations: More research is needed to study whether the lack of foods containing antimicrobial components is a risk factor for spontaneous PTD.			
Summary for Current Clinical Practice Question: Garlic intake in pregnancy is associated with reduced risk of spontaneous PTD and raisin intake are associated with lowered risk of PPROM. Overall, alliums and dried fruits were associated with less risk of PTD.			

Source: Myhre, R., Brantsaeter, A., Myking, S., Gjessing, H., Sengpiel, V., Meltzer, H., Haugen, M., & Jacobsson, B. (2011). Intake of probiotic food and risk of spontaneous preterm delivery. *American Journal of Clinical Nutrition, 93*(1), 151–157. https://doi.org/10.3945/ajcn.110.004085

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To see whether intake of food with probiotics might reduce pregnancy complications caused by pathogenic microorganisms, therefore reducing the risk of spontaneous preterm delivery (PTD). **Sample/Setting:** 18,888 pregnant women, of which 950 had uncomplicated pregnancies with spontaneous PTD between 22-36 weeks gestation, and 17,938 women who delivered at term served as the control group. **Level of evidence:** Level III **Quality of evidence:** Good	Prospective cohort study. Data was collected from the Norwegian Mother and Child Cohort Study between 1999-2008. Eligible women answered questionnaires beginning at 15 weeks gestation until their child was age 7. 18,888 women were eligible and completed both the questionnaires and food reports for this study.	The results showed a statistically significant association between intake of probiotic food items and spontaneous PTD (P =0.044), which increased (P = 0.038) after adjustment for parity, maternal educational level, and physical activity. There was a weak dose-dependent effect where greater intake had further reduced risk of PTD. **Conclusion:** Women who reported habitual intake of probiotic dairy products had a reduced risk of spontaneous preterm delivery.	**Strengths:** Prospective design including questionnaires gathered from early on in the pregnancy, large sample size and strict inclusion and exclusion criteria **Limitations:** The self-reporting of dietary intake by participants means that the data is not able to be confirmed by the researchers. Vaginal cultures were not taken to assess the vaginal microbiome.

Author Recommendations: Because the effects of specific probiotics in relation to spontaneous PTD are strain specific, it is important that studies are conducted at a strain-specific level. RCTs should evaluate whether the presence of foods containing probiotics is protective and their absence is a risk factor for PTD.

Summary for Current Clinical Practice Question: Habitual probiotic dairy intake can reduce the risk of spontaneous preterm delivery in low-risk women.

Source: Ozkan, S. A., Kadioglu, M., & Rathfisch, G. (2017). Restricting oral fluid and food intake during labour: A qualitative analysis of women's views. *International Journal of Caring Sciences, 10*(1), 235–242.

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To identify the effects of restricting fluid and food during labour on women's feelings and thoughts, and to aim to increase satisfaction and improve maternal and fetal outcomes. **Sample/Setting:** 30 low-risk women receiving no parenteral hydration other than that for induction of labor, receiving no labor analgesia, and who delivered vaginally. Conducted in Turkey in 2012. **Level of evidence:** Level III **Quality of evidence:** Good	Descriptive, phenomenological qualitative study. The interview included three questions: "How did restriction of fluid or food intake make you feel while you were waiting for labour?", "Did hunger and thirst affect you during labour?","How did being hungry in the prenatal period affect you in the postnatal period?" followed by clarifying questions.	Multiparous women stated that they came to hospital after they had eaten something and drunk water, and thus tolerated labour performance better. Themes of "Hunger, thirst, asthenia, a sense of fainting, and dryness of mouth" were noted during active labor. The women stated that they would have preferred warm meals in the postpartum period rather than cold fruit juices. **Conclusion:** The participants shared feelings of hunger, thirst, and fatigue due to oral fluid and food intake being restricted during labor, which affected the natural course of labor.	**Strengths:** The interviews were thoroughly analyzed to discern themes and meaningful units by using Georgi's phenomenological method analysis in 4 phases. Confidentiality was maintained, and a thorough literature review completed for background information. **Limitations:** As a phenomenological study, the findings may not yield precise or generalizable results. The findings of this study cannot be generalized, however they aim to help the reader better understand this phenomenon.

Author Recommendations: The present study recommends that women with low complication risks should be allowed to have fluid and food during labour. Conflicting evidence on carbohydrate solutions requires further research.

Summary for Current Clinical Practice Question: Low-risk women who are not permitted to eat or drink during their labors report feeling hungry, thirsty, and fatigued, and should be allowed to have food and fluid during labor.

Source: Shea-Lewis, A., Eckardt, P., & Stapleton, D. (2018). An investigation into the safety of oral intake during labor: Findings from this quantitative retrospective study suggest ad lib intake may have benefits. *The American Journal of Nursing., 118*(3), 24-33. doi: 10.1097/01.NAJ.0000530913.80349.53

Purpose/Sample	Design (Method/Instruments)	Results	Strengths/Limitations
Purpose: To compare maternal and neonatal outcomes including type of delivery, maternal postpartum, and neonatal Apgar scores between laboring women who were allowed to eat compared to women with NPO/ice chip status. **Sample/Setting:** 2,784 women from a suburban community hospital in the northeastern United States. **Level of evidence:** Level III **Quality of evidence:** Good	Retrospective, observational, cross-sectional study Participants were from one hospital with different provider groups and protocols regarding oral intake or NPO status. The ad lib group n=1,198 and NPO group n=1,599. Data was analyzed using Stata 11 and IBM SPSS statistics.	The NPO group had significantly higher intrapartum complications (P=0.002), and were more likely to have cesarean birth (P<0.001). There was no difference with maternal disposition to postpartum or neonatal Apgar score at one minute and five minute. There were also no significant differences in neonatal outcomes (Apgar scores) or morbidity or mortality rates in either group. **Conclusion:** Eating during labor did not impose any harm nor increase morbidity or mortality in either group.	**Strengths:** A control group was present with recognition of potential confounding variables and thorough synthesis of the data. **Limitations:** The lack of randomization contributed to the casual limitation of the study findings. The study focused on predominantly Caucasian women 94% with an average age group of 31 years and with private insurance, thus not applicable to the general population.

Author Recommendations: Low risk women should self regulate their own intake during labor. Further research is necessary to evaluate the type of foods most beneficial during labor and preferred.

Summary for Current Clinical Practice Question: Allowing low-risk women to eat during labor does not show any adverse obstetric or neonatal outcomes.

Appendix II – PRISMA Diagram