Investigation on the status of oral intake management measures during labor in China

Chuan-Ya Huang, MDaba,b, Bi-Ru Luo, PhDaba,b, Juan Hu, MDaba,b

Abstract
The World Health Organization recommended that the oral intake of low-risk pregnant women during labor should not be restricted. Hospitals in different countries take different measures to manage the intake during labor, but it is not clear about the current situation of oral intake management measures in the hospital during labor in China. Thus, the objective of this study was to investigate the current situation of oral intake management measures during labor in China, so as not only provide references for developing appropriate midwifery technology training and formulating relevant policies, but also provide a basis for exploring and implementing better oral intake management measures in the future.

A cross-sectional survey was conducted. From December 2017 to November 2018, the oral intake management measures of 1213 hospitals in 22 provinces, cities, and autonomous regions in China were investigated by a self-designed questionnaire. \( \chi^2 \) test was used for statistical analysis.

Different hospitals in China have adopted different oral intake management measures. Among the 1213 hospitals, 939(77.4%) hospitals took measures to allow pregnant women to bring the easily digestible food, 813(67.0%) hospitals took measures to allow pregnant women to eat what they wanted to eat. Few hospitals provide pregnant women with oral nutrition solution or provide a suitable diet for pregnant women. Thirty-four (2.8%) hospitals still restrict pregnant women’s fluid intake.

Oral intake management measures that are more suitable for Chinese pregnant women should be explored to better ensure the women energy needs and they safely go through childbirth.

Abbreviations: ACNM = American College of Nursing Midwives, IP Address = Internet Protocol Address, WHO = World Health Organization.

Keywords: oral intake, food, labor, China

1. Introduction
Natural childbirth is a process that requires huge amounts of energy; pregnancy can also lead to a higher basal metabolic rate, so oral intake management measures in this process have been the focus of research.\[1\–4\] If the pregnant women do not get enough energy intake during the labor process, it may lead to lower blood sugar, which will accelerate the decomposition of fat and increase the production of ketone bodies.\[5\–7\] At the same time, prolonged labor due to lack of energy may be related to the cesarean section, chorioamnionitis, postpartum hemorrhage, and adverse neonatal outcomes.\[8\–10\] The World Health Organization (WHO) suggested that timely energy and fluid supplementation during vaginal delivery is one of the technical measures to reduce the cesarean section.\[11\] In the past, it was believed that pregnant women who gave birth naturally may be transferred to cesarean section at any time. To prevent pregnant women from anesthesia accidents during labor, the measures of limit eating and drinking during the labor process were adopted.\[11\] However, with the development of anesthesia technology, some researchers believed that feeding during surgery would not cause maternal death due to aspiration during surgery, and it should not be routinely implemented for pregnant women to limit eating and drinking.\[12\–14\] Studies by Simkin et al and Armstrong et al show that women were afraid of being limited eating and drinking but want to eat during labor.\[15\–16\]

Different countries have different oral intake management measures. According to an international survey conducted by the American College of Nursing Midwives (ACNM), hospitals in the United States often only allow pregnant women to eat clear liquid in the incubation period, gave water or ice in the active period, and only <10% of hospitals allowed them to eat in the flattened period, but not in the active period. Ninety-six percent of the departments of obstetric medical institutions in the England allowed eating, of which 32.8% do not limit eating and drinking. In the Netherlands, 73% of Obstetricians and 67% of midwives let their mothers decide whether to eat or not.\[17\–18\] In China, there are few studies on the oral intake management measures,
and there is no research report on the actual implementation of the oral intake management during the labor process in Chinese hospitals. This study intends to investigate the specific situation of Chinese hospitals’ implementation of oral intake management measures during the labor process, to provide a basis for better management of oral intake during labor, and to promote appropriate technologies for midwifery.

2. Materials and methods

2.1. Participants

This cross-sectional study was conducted from December 2017 to November 2018. We used stratified sampling and convenient sampling to select hospitals from 22 provinces, municipalities, and autonomous regions in China; a total of 1254 midwifery medical institutions conducted a questionnaire survey. All hospitals had joined the China Maternal and Child Health Association Midwifery Branch.

2.2. Data collection

The questionnaire was designed by ourselves. Through consulted relevant books and literature, and revised by 5 experts from the China Maternal and Child Health Association Midwifery Branch, we formed the questionnaire of “Questionnaire on the use of oral intake management measures” (Table 1). The 5 experts had worked in the obstetrics department or delivery room for >20 years. The questionnaire included 2 parts: the basic information of the hospital, the specific implementation of the oral intake management measures. The Cronbach α coefficient of the questionnaire was 0.822.

The questionnaire survey was conducted on the Internet platform. Before the survey, the main person in charge of this subject trained the investigators in filling in the questionnaire, matters needing attention in reviewing, quality inspection of the questionnaire, and so on. The trained investigator sent the questionnaire via email or WeChat to the head nurse of obstetrics or delivery room of each medical institution, and answered the questions related to the questionnaire by phone and email. The same investigator reviewed the questionnaire. To ensure the authenticity of the data, each IP address set in the background of the questionnaire can only submit the questionnaire once, and the questionnaire with obvious logical errors would be eliminated. Finally, 1254 questionnaires were sent out, and 1213 effective questionnaires were recovered. The effective recovery rate was 96.73%.

The study was approved by the Ethics Committee of West China Second University Hospital, Sichuan University. Informed consent was obtained from all participants.

2.3. Statistical analysis

SPSS 23.0 was used to analyze the data (SPSS Inc, Chicago, IL). The use cases and percentages of counting data were described, and the χ² test was used to compare the data among groups. The difference was statistically significant (\( P < .05 \)).

3. Results

A total of 1213 hospitals had been investigated, and were classified into general hospitals and specialist hospitals according to the hospitals’ type, third-grade hospitals, and second-grade hospitals according to the hospitals’ level (Table 2).

3.1. Overall situation of oral intake management measures

Among the 1213 hospitals, 939 hospitals (77.4%) allowed pregnant women to bring the easily digestible food, 813 hospitals (67.0%) allowed pregnant women to eat as they want, 745 hospitals (61.4%) allowed pregnant women to drink sports drinks, 744 hospitals (61.3%) allowed pregnant women to eat chocolate and 108 hospitals (8.9%) allowed pregnant women eating boiled eggs. There were only 98 hospitals (8.1%) that provided suitable diets for each pregnant woman and 73 hospitals (6.0%) who had self-administered oral nutrient solution. Thirty-four hospitals (2.8%) adopted the measure to not allow the pregnant women to drink, and 109 hospitals (9.0%) didn’t allow pregnant women to eat solid food. There are 12 hospitals (1.0%) that adopt other oral intake management measures not mentioned above (Table 3).

| Table 1 Questionnaire on the use of oral intake management measures. |
|---------------------------------------------------------------|
| **Question** | **Answer** |
| First part: The basic information of the hospital | |
| 1. What level of hospital is your hospital? (Single choice questions) | A. Third-grade hospital  
B. Second-grade hospital  
A. General hospital  
B. Specialized hospital |
| 2. What type of hospital is your hospital? (Single choice questions) | |
| Second part: The specific implementation of the oral intake management measures | |
| 1. Which of the following measures does your hospital take in the process of labor? (Multiple choice questions) | A. Easily digestible food carried by the pregnant women  
B. Pregnant women eat as they want  
C. Sports drink  
D. Chocolate  
E. Solid food fasting  
F. Boiled eggs  
G. Hospital provides suitable diet for the pregnant women  
H. Preparation of oral nutrient solution by the hospital  
I. Liquid fasting  
J. Other measures (please write this) |
3.2. Oral intake management measures in different types of hospitals

In the 3 measures that is drinking sports drinks, hospitals provide a suitable diet for the pregnant women and preparation of oral nutrient solution by the hospital, the number of specialized hospitals is more than that of general hospitals, and the difference is statistically significant. These 2 types of hospitals have no significant differences in the other oral intake management measures (Table 4).

3.3. Oral intake management measures in different levels of hospitals

In the 2 measures that is drinking sports drinks and preparation of oral nutrient solution by the hospital, the number of the third-grade hospital is more than that of the second-grade hospital. However, in the 2 measures that is eating chocolate and pregnant women eat as they want, the number of the second-grade hospital is more than that of the third-grade hospital. No significant difference was found between third-grade hospital and second-grade hospital in the other oral intake management measures (Table 5).

4. Discussion

In this study, we surveyed 1213 hospitals’ oral intake management measures in the process of labor in China. A total of 77.4% of the hospitals’ oral intake management measures adopted were to allow pregnant women to bring the easily digestible food, such as bread and oatmeal. Scutton et al compared pregnant women who ate a light diet and those who ate only water during labor, and found no difference in the duration of the labor and the postnatal outcome of the mother and child, but pregnant women who took a light diet had a lower incidence of ketosis. However, when taking these management measures, doctors or midwives need to do adequate health education for pregnant women before giving birth so that pregnant women can accurately understand what is easily digestible food.

Sixty-seven percent of the hospitals took measures to manage the food intake that pregnant women can eat as they want, with secondary hospitals being the most common. This shows that these hospitals took a very open attitude in the oral intake management of labor during the delivery process. Pregnant women can choose the diet provided by the hospital or bring their own diet. The study of O Sullivan et al showed that pregnant women who ate according to their own wishes are not different from pregnant women who take oral water in terms of the duration of labor and the incidence of vomiting. The study of Tranmer et al also showed that the incidence of postpartum dystocia among pregnant women who ate according to their own wishes is not different from that of women who only take ice or water, which explain that the pregnant woman is safe to eat as she wants.

A total of 61.4% of hospitals supported pregnant women’ consumption of sports drinks during labor. Sports medical scientists believed that the process of childbirth is similar to the process of athletes strenuous exercise, and sports drinks contain a lot of energy. In 2002, a study conducted by Kubli et al allowed pregnant women to drink sports drinks early in the delivery process, and found that although sports drinks did not reduce the time of delivery and the incidence of vomiting, but could reduce the amount of ketones produced by pregnant women. A total of 61.3% of hospitals allow pregnant women to eat chocolate. Chocolate contains a lot of high-quality carbohydrates, the main ingredients are sucrose, cocoa butter, protein,
and so on. Chocolate digests and absorbs quickly, and can produce a lot of energy. In addition, chocolate also contains a small amount of caffeine. Caffeine has an exciting effect on the brain, which may stimulate the maternal spirit and relieve fatigue. It can also excite the heart and dilate blood vessels, ensure the fetal blood supply in the mother’s body, and avoid fetal distress occur.[22,23] However, some studies showed that although carbohydrate intake does not change the speed and outcome of delivery during labor, it is also harmless.[22,23]

Nine percent of hospitals forbade pregnant women from eating solid food. Childbirth is a process in which the mother continuously consumes energy, supplementing solid food is beneficial and food intake should be increased.[2,3] However, some studies have shown that eating solid foods during labor can lead to prolonged labor, especially during the first labor.[24] The “2014 Chinese Anesthesiology Guide and Expert Consensus” states that during the period of labor, low-risk expectant mothers can eat liquid food without residuals, but solid food is prohibited during the delivery process.[25] The reason is that after eating, the burden on the digestive tract will be increased, the blood flow will be concentrated in the digestive tract, resulting in a decrease in uterine blood flow and affecting the contraction of uterine muscle smooth muscle, which may lead to prolonged labor.[26] Hospitals that ban maternal food solids during labor may agree to this point more.

A total of 8.9% of hospitals adopted the measure of eating boiled eggs. An egg weighs about 50 g, contains 7 g of protein, 6 g of fat, and produces 82 kcal of heat.[27] The amino acid ratio of egg protein is very suitable for human physiological needs, and is easily absorbed by the body, with high nutritional value. However, if the egg is boiled in boiling water for >10 minutes, the internal protein structure becomes tighter, and it is not easy to contact protein digestive enzymes in gastric juice, which is not conducive to digestion to a certain extent.

The proportion of preparation of oral nutrient solution by the hospital is 6.0%. According to the hospital level, more third-grade hospitals are adopting this measure than second-grade hospitals, which may be related to the fact that some second-grade hospitals do not have professionals who can prepare oral nutrition solutions. The taste of nutrient solution is not good, or grade hospitals do not have professionals who can prepare oral nutrition solutions. The taste of nutrient solution is not good, or grade hospitals do not have professionals who can prepare oral nutrition solutions. This measure has the highest proportion of implementation in specialized hospitals, which may be related to the richer human resources in specialized hospitals and the greater emphasis on the development of suitable technologies for midwifery.

In 1997, the WHO proposed that pregnant women should be given energy and water in time during labor.[1] However, according to the results of this study, 2.8% of hospitals still adopt measures to prevent drinking water or drinks. In 2013, Singata et al.[30] conducted a meta-analysis and found that it was unnecessary to restrict the food and water consumption of low-risk pregnant women who might not need anesthesia during labor. Studies by Sleutel et al and O’Sullivan et al also suggest that fluid consumption is feasible and safe during labor, at least in women at low risk of complications.[19,31]

The limitation of this study is that there is no further reason for investigating why each hospital has adopted this measure of oral intake management, which can be improved in future studies.

5. Conclusion

In China’s hospitals, the measures taken the most are the easily digestible food carried by pregnant women and allow pregnant women to eat as they wish. Few hospitals provide oral nutrition solutions for pregnant women or provide a suitable diet for pregnant women according to the situation of pregnant women. There is a great difference between Chinese hospitals in the management of oral intake, so we should explore more suitable oral intake management measures for Chinese women, so as to better ensure the demand for energy and the safe passage of childbirth.

---

Table 5

| Variables                              | Third-grade hospital (n=672) | Second-grade hospital (n=541) | χ² | P     |
|---------------------------------------|-----------------------------|------------------------------|----|-------|
| Easily digestible food carried by the pregnant women | 527 (78.4) | 412 (76.2) | 0.881 | .35   |
| Pregnant women eat as they want        | 434 (64.6) | 379 (70.1) | 4.061 | .04   |
| Sports drink                          | 434 (64.6) | 311 (57.5) | 6.371 | .01   |
| Chocolate                             | 386 (57.4) | 358 (66.2) | 9.639 | <.001 |
| Solid food fasting                    | 69 (10.3) | 40 (7.4) | 3.027 | .08   |
| Boiled eggs                           | 53 (7.9) | 55 (10.2) | 1.920 | .17   |
| Hospital provides suitable diet for the pregnant women | 63 (9.4) | 35 (6.5) | 3.407 | .07   |
| Preparation of oral nutrient solution by the hospital | 57 (8.5) | 16 (3.0) | 16.174 | <.001 |
| Liquid fasting                        | 18 (2.7) | 16 (3.0) | 0.086 | .77   |
| Other measures                        | 7 (1.0) | 5 (0.9) | 0.042 | .88   |
Acknowledgments
The authors are grateful to the midwifery director of each province/city/autonomous region and the head nurse of the delivery room/obstetric department who participated in this survey.

Author contributions
Conceptualization: Bi-Ru Luo.
Data curation: Chuan-Ya Huang, Juan Hu.
Formal analysis: Chuan-Ya Huang, Bi-Ru Luo.
Investigation: Chuan-Ya Huang, Juan Hu, Bi-Ru Luo.
Methodology: Chuan-Ya Huang, Juan Hu, Bi-Ru Luo.
Project administration: Juan Hu, Bi-Ru Luo.
Resources: Chuan-Ya Huang, Juan Hu, Bi-Ru Luo.
Software: Chuan-Ya Huang, Juan Hu.
Validation: Chuan-Ya Huang, Bi-Ru Luo.
Writing – original draft: Chuan-Ya Huang.
Writing – review & editing: Juan Hu, Bi-Ru Luo.

References
[1] World Health Organization. Care in Normal Birth: A Practical Guide. Maternal and Newborn Health/Safe Motherhood Unit, Family and Reproductive Health; 1997; Geneva (Switzerland).
[2] Parsons M, Bidewell J, Nagy S. Natural eating behavior in latent labor and its effect on outcomes in active labor. J Midwifery Womens Health 2011;56:1–6.
[3] Stenteberg M, Bor P. There is no evidence for restricting eating and drinking during labour. Ugeskr Laeger 2010;172:3166.
[4] Dunsworth HM, Warrener AG, Deacon T, et al. Metabolic hypothesis for human altriciality. Proc Natl Acad Sci USA 2012;109:15212–6.
[5] Kubli M, Scrutton MJ, Seed PT, et al. An evaluation of isotonic “sport drinks” during labor. Anesth Analg 2002;94:404–8.
[6] Scrutton MJL, Metcalfe G, Lowy C, et al. Eating in labour. A randomised controlled trial assessing the risks and benefits. Anaesthesia 1999;54:329–34.
[7] YuZhu X, YingXin D, ZhengWei W. Application of nutrition diet liquid for human altriciality. Proc Natl Acad Sci USA 2012;109:15212–6.
[8] Yulghunlu FA, Shafaie FS, Mirghafourvand M, et al. 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. J Matern Fetal Neonatal Med 2020;33:289–96.
[9] Cheng YW, Delaney SS, Hopkins LM, et al. The association between the length of first stage of labor, mode of delivery, and perinatal outcomes in women undergoing induction of labor. Am J Obstet Gynecol 2009;201:477.e471–77.
[10] Laughon SK, Berghella V, Sundaram R, et al. Neonatal and maternal outcomes with prolonged second stage of labor. Obstet Gynecol 2014;124:8149.
[11] YuWen W, QiTao H, MingLi Z, et al. Research progress on feeding and intake management during labor. Obstet Gynecol Genet 2018;8:47–53.
[12] YanYan M, RuYan P. Input management during normal labor. Chin J Obstet Gynecol 2015;51:53–8.
[13] Cardulli A, Sacco C, Anastasio H, et al. Less-restrictive food intake during labor in low-risk singleton pregnancies: a systematic review and meta-analysis. Obstet Gynecol 2017;129:473–80.
[14] Phelps K, Deavers J, Seehusen DA, et al. PURL: Let low-risk moms eat during labor? J Fam Pract 2018;67:379–80.
[15] Armstrong TS, Johnston IG. Which women want food during labour? Results of an audit in a Scottish DGH. Health Bull 2000;58:141–4.
[16] Smikin P. Stress, pain, and catecholamines in labor: part 2. stress associated with childbirth events: a pilot survey of new mothers. Birth 1987;13:334–40.
[17] American College of Nurse-MidwivesProviding oral nutrition to women in labor: American College of Nurse-Midwives. J Midwifery Womens Health 2016;61:528–34.
[18] YanPing T, XinRen X. Research progress on diet management during labor. Nurs Rehabil 2018;17:40–3.
[19] O’Sullivan G, Liu B, Hart D, et al. Effect of food intake during labour on obstetric outcome: randomised controlled trial. BMJ (online) 2009;338:b784.
[20] Tramm JE, Hodnett ED, Hannah ME, et al. The effect of unrestricted oral carbohydrate intake on labor progress. J Obstet Gynecol Neonatal Nurs 2003;34:319–28.
[21] Hou Z, Kaisen G. Research progress of in process management. Nursing and rehabilitation 2017;635–8.
[22] Simonet TG, Desmeules C, Hanouz I, et al. Effect of oral carbohydrate intake during labor on the rate of instrumental vaginal delivery: a multicenter, randomized controlled trial. Anesth Analg 2019;11:1–7.
[23] Malin G, Buga G, Thornton J, et al. Does oral carbohydrate supplementation improve labour outcome? A systematic review and individual patient data meta-analysis. BJOG 2016;123:510–7.
[24] Berg hellka V, Baxter JK, Chauhan SP. Evidence-based labor and delivery management. Am J Obstet Gynecol 2008;199:445–54.
[25] Branch CMAA2014 Chinese Anesthesiology Guide and Expert Consensus. Beijing: People’s Medical Publishing House; 2014.
[26] Scheppers HCJ, Thans MCJ, Jong PAd , et al. A double-blind, randomised, placebo controlled study on the influence of carbohydrate solution intake during labor. BJOG 2002;109:178–81.
[27] GuangYu J, ZengNing L, Wei C. Clinical Nutrition. Beijing: People’s Medical Publishing House; 2017.
[28] YuZhao X, YingXin D, ZhengWei W. Application of nutrition diet liquid in the process of childbirth. Fujian Med J 2003;25:88–9.
[29] He H, Xia G, YuYing Z, et al. Impact of personalized diet guidance during labor on maternal and infant outcomes. Guangxi Med J 2019;41:400–2.
[30] Singata M, Tranner J, Gyte GM. Restricting oral fluid and food intake during labour. Cochrane Database of Systematic Reviews 2013; CD003930.
[31] Sleutel M, Golden SS. Fasting in labor: relic or requirement. Obstet Gynecol Neonatal Nurs 1999;28:507–28.