Postprint of a Study on the Impact of Intrapartum Fever Severity on Maternal and Neonatal Outcomes

Authors: Liu Liheng, Zou Liying, rice snow, Hou Lei, Wang Xin, Zou Liying

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Abstract

Background: Intrapartum fever is a common clinical manifestation in obstetrics, increasing the rates of cesarean section, operative vaginal delivery, and neonatal asphyxia. Factors influencing intrapartum fever include pregnancy and perinatal complications, induction time, labor analgesia, trial of labor duration, delivery room temperature, and number of internal examinations; these factors may exist independently or be interrelated. In pregnant women with intrapartum fever, does a higher maximum temperature correlate with worse maternal and neonatal outcomes? Research on this question is beneficial for guiding clinical prognosis and management strategies for pregnant women with intrapartum fever.

Objective: To investigate the impact of intrapartum fever and its degree on maternal and neonatal outcomes in nulliparous women with term singleton pregnancies undergoing trial of labor.

Methods: A total of 994 nulliparous women with term singleton pregnancies who delivered at our hospital in 2019 and were diagnosed with intrapartum fever during labor were included as the study subjects. During the same period, non-febrile nulliparous women with singleton pregnancies meeting the criteria were enrolled at a 1:1 ratio as the control group. General maternal data, complication incidence, induction/augmentation of labor, delivery mode, and maternal and neonatal outcomes were compared between the fever group and the control group. Furthermore, the fever group was divided into four subgroups based on the degree of intrapartum fever temperature: Subgroup 1 with temperature 37.3–37.5°C (n=142), Subgroup 2 with temperature 37.5–<38.0°C (n=600), Subgroup 3 with 38.0–<38.5°C (n=213), and Subgroup 4 with temperature $ $38.5°C (n=39). Comparative analyses of general maternal data, induction/augmentation of labor, obstetric complications, delivery mode, and maternal and neonatal outcomes were performed among the subgroups.

Results: The fever group included 994 cases, and the control group included 987 cases. The fever group had higher rates of induction/augmentation of labor and a higher proportion of induction time $ $3 days compared with the control group (P<0.05). The incidences of premature rupture of membranes, hypertensive disorders of pregnancy, and gestational diabetes mellitus were higher in the fever group than in the control group (P<0.05). The fever group also had higher rates of cesarean section, puerperal infection, neonatal asphyxia, meconium-stained amniotic fluid, and neonatal transfer to NICU compared with the control group (P<0.05). There was no statistically significant difference in neonatal birth weight between the two groups (P>0.05). Among the subgroups, there were no statistically significant differences in the rates of induction/augmentation of labor, proportion of induction time $ $3 days, or incidences of premature rupture of membranes, hypertensive disorders of pregnancy, and gestational diabetes mellitus (P>0.05). No statistically significant differences were observed among the subgroups in the rates of cesarean section, puerperal infection, neonatal asphyxia, meconium-stained amniotic fluid, neonatal transfer to NICU, or neonatal birth weight (P>0.05).

Conclusion: In the intrapartum fever population, the incidences of maternal complications, induction/augmentation of labor, cesarean section, puerperal infection, and neonatal asphyxia were increased; however, no correlation was demonstrated between the degree of temperature elevation and delivery mode or maternal and neonatal outcomes.

Full Text

Abstract

Background: Intrapartum fever is a common clinical manifestation in obstetrics that increases the rates of cesarean section, vaginal instrumental delivery, and neonatal asphyxia. Influencing factors include pregnancy comorbidities and complications, labor induction duration, labor analgesia, trial of labor time, delivery room temperature, and number of pelvic examinations. These factors may exist independently or be causally interrelated. In pregnant women with intrapartum fever, does a higher maximum body temperature correlate with worse maternal and neonatal outcomes? Investigating this question can help guide clinical prognosis and management strategies for pregnant women with intrapartum fever.

Objective: To investigate the effect of intrapartum fever and its severity on maternal and fetal outcomes during trial of labor among term singleton primiparas.

Methods: This retrospective case-control study included 994 term singleton primiparas who delivered in our hospital in 2019 and were diagnosed with intrapartum fever during labor. A control group of 987 term singleton primiparas without fever was enrolled concurrently in a 1:1 ratio based on matching criteria.

General characteristics, complications, labor induction status, delivery mode, and maternal-infant outcomes were compared between the fever and control groups. The fever group was further divided into four subgroups based on maximum intrapartum temperature: Subgroup 1 (37.3–37.5°C, n=142), Subgroup 2 (37.5–<38.0°C, n=600), Subgroup 3 (38.0–<38.5°C, n=213), and Subgroup 4 ($ $38.5°C, n=39). General characteristics, labor induction, obstetric complications, delivery mode, and maternal-fetal outcomes were compared across these subgroups.

Results: The fever group comprised 994 cases and the control group 987 cases. The fever group had significantly higher rates of labor induction and prolonged induction ($ $3 days) compared with the control group (P<0.05). The incidences of premature rupture of membranes (PROM), hypertensive disorders of pregnancy, and gestational diabetes mellitus were also higher in the fever group (P<0.05). Additionally, the fever group showed higher rates of cesarean delivery, puerperal infection, neonatal asphyxia, amniotic fluid contamination, and neonatal NICU admission (P<0.05). No significant difference was observed in neonatal birth weight between the two groups (P>0.05).

In subgroup analyses, no statistically significant differences were found among the four subgroups in terms of labor induction rates, proportion of induction $ $3 days, or incidences of PROM, hypertensive disorders, and gestational diabetes (P>0.05). Similarly, no significant differences were observed across subgroups for cesarean delivery, puerperal infection, neonatal asphyxia, amniotic fluid contamination, NICU admission rates, or neonatal birth weight (P>0.05).

Conclusion: Intrapartum fever is associated with increased rates of maternal complications, labor induction, cesarean delivery, puerperal infection, and neonatal asphyxia. However, the degree of temperature elevation does not correlate with delivery mode or maternal-infant outcomes.

Keywords: Intrapartum; Fever; Degree of fever; Cesarean section; Neonatal asphyxia

Introduction

Labor is a prolonged process, and various factors can cause maternal temperature elevation during delivery. The phenomenon of temperature rise during labor is termed intrapartum fever, with an incidence of approximately 20% [1]. Intrapartum fever can be classified as infectious or non-infectious. Infectious intrapartum fever, also known as intrauterine infection, can lead to uterine atony, prolonged labor, extended oxytocin use, increased rates of forceps delivery and cesarean section, postpartum hemorrhage, and puerperal morbidity. If delivery is not promptly terminated, it may result in amniotic fluid contamination, neonatal asphyxia, sepsis, or even septicemia, prolonging hospital stays [2-4]. Non-infectious intrapartum fever lacks evidence of infection [5] and is associated with factors such as altered thermoregulation from patient-controlled epidural analgesia (PCEA), dehydration from inadequate fluid intake during labor, and

heat generated by muscular activity. Labor analgesia is an independent risk factor for intrapartum fever [6], with approximately 20% of women receiving PCEA developing epidural-related maternal fever [7-9]. Huang et al. [10] found that the risk of intrapartum fever with labor analgesia is 2.35 times higher than without analgesia. Additional non-obstetric factors such as high delivery room temperature, inadequate fluid intake, and excessive maternal body weight may also contribute to intrapartum fever.

Intrapartum fever presents a significant challenge for obstetricians, as it can lead to adverse maternal and neonatal outcomes. However, no definitive evidence exists regarding whether higher temperatures correlate with worse outcomes. This study enrolled pregnant women with intrapartum fever and stratified them by maximum temperature to investigate the impact of different degrees of temperature elevation on maternal and infant outcomes.

Methods

Study Population

This retrospective case-control analysis included 994 term singleton primiparas who underwent trial of labor at Beijing Obstetrics and Gynecology Hospital, Capital Medical University, in 2019 and developed intrapartum fever. A control group of 987 afebrile singleton primiparas was enrolled concurrently in a 1:1 ratio, matched for age and gestational age.

Inclusion criteria for the fever group: (1) Gestational age 37–42 weeks; (2) Singleton live fetus in cephalic presentation; (3) Primipara; (4) Candidates for vaginal delivery who entered active labor; (5) Temperature $ $37.3°C during labor.

Inclusion criteria for the control group: (1) Gestational age 37–42 weeks; (2) Singleton live fetus in cephalic presentation; (3) Primipara; (4) Candidates for vaginal delivery who entered active labor.

Exclusion criteria for both groups: (1) Gestational age <37 weeks; (2) Multiple pregnancy; (3) Pregnancy comorbidities; (4) Temperature $ $37.3°C before labor onset; (5) Multipara; (6) Incomplete data.

Research Methods

General maternal data were analyzed, and complications including premature rupture of membranes (PROM), hypertensive disorders of pregnancy (HDCP), and gestational diabetes mellitus (GDM) were compared between groups. Labor induction status (whether performed; duration including cervical ripening and oxytocin induction days), delivery mode, and maternal-infant outcomes were also compared. The fever group was further divided into four subgroups based on maximum intrapartum temperature: Subgroup 1 (37.3–<37.5°C, n=142), Subgroup 2 (37.5–<38.0°C, n=600), Subgroup 3 (38.0–<38.5°C, n=213), and

Subgroup 4 ($ $38.5°C, n=39). General characteristics, labor induction, obstetric complications, delivery mode, and maternal-fetal outcomes were compared across these subgroups. Temperature measurement was performed using axillary temperature at rest, avoiding postprandial periods and after hot beverage consumption.

Statistical Analysis: Continuous variables with normal distribution were expressed as mean ± standard deviation ($\bar{x}\pm s$) and compared using ANOVA for multiple groups or independent samples t-test for two groups. Categorical variables were expressed as frequency (n) or percentage (%) and compared using ^{2} test or Fisher's exact test. $P<0.05$ was considered statistically significant.

Results

Comparison of General Data Between Groups

The final cohort included 994 cases in the fever group and 987 in the control group. No significant differences were observed in maternal age or gestational age between the two groups ($P>0.05$) .

Comparison of Labor Induction and Complications

The fever group had significantly higher rates of labor induction and prolonged induction ($ $3 days) compared with the control group ($P<0.05$). The incidences of PROM, hypertensive disorders of pregnancy, and gestational diabetes were also significantly higher in the fever group ($P<0.05$) .

Comparison of Delivery and Neonatal Outcomes

The fever group exhibited significantly higher rates of cesarean delivery, puerperal infection, neonatal asphyxia, amniotic fluid contamination, and neonatal NICU transfer compared with the control group ($P<0.05$). No significant difference was found in neonatal birth weight between the two groups ($P>0.05$) . No maternal or neonatal deaths occurred in either group.

Subgroup Analyses

Comparison of General Characteristics: No significant differences were observed in maternal age or gestational age across the four subgroups ($P>0.05$) .

Comparison of Labor Induction and Pregnancy Complications: No significant differences were found among subgroups in PROM incidence, hypertensive disorders, gestational diabetes, labor induction rates, or proportion of induction $ $3 days ($P>0.05$) .

Comparison of Delivery Mode and Neonatal Outcomes: No significant differences were observed across subgroups in cesarean delivery rates, puerperal

infection, neonatal asphyxia, amniotic fluid contamination, NICU admission rates, or neonatal birth weight (P>0.05) .

Discussion

Intrapartum fever is a common clinical problem that not only increases maternal physical exhaustion but is also closely associated with elevated risks of adverse neonatal outcomes such as intrauterine infection and cerebral palsy [11]. Previous studies have demonstrated that maternal inflammatory responses progressively intensify with advancing gestation [12-13], and Riley et al. [14] proposed that pregnancy-related inflammatory responses constitute the pathophysiological basis of intrapartum fever. Additionally, pain stimuli during labor can trigger maternal stress responses, increasing oxygen consumption and cardiovascular burden, which may affect placental-fetal oxygen exchange and elevate the risk of fetal distress [16-17]. Intrapartum fever also increases maternal heart rate, cardiac output, basal metabolic rate, and oxygen consumption, leading to accumulation of acidic metabolic products and potential acid-base imbalance, particularly in women with poor cardiovascular function or underlying medical conditions [18].

Multiple factors can influence maternal temperature during labor, with intrauterine infection being the primary consideration. This study found that the fever group had higher rates of labor induction and prolonged induction ($ $3 days), suggesting that excessive artificial interventions—including prolonged induction and frequent pelvic examinations—may contribute to intrapartum fever. Such interventions increase opportunities for retrograde infection during labor [24-25]. Furthermore, PROM incidence was significantly higher in the fever group. PROM increases the risk of intrauterine infection [19], and underlying reproductive tract infections may be important causes of PROM, manifesting clinically as intrapartum fever. Therefore, strict indications for labor induction should be observed during the perinatal period to minimize unnecessary interventions, with dynamic assessment and enhanced monitoring of symptoms, signs, and laboratory tests for women with prolonged induction or PROM to enable early detection of potential infection.

Previous research has established that intrapartum fever adversely affects maternal and neonatal outcomes [20-23]; however, evidence regarding the correlation between temperature elevation severity and adverse outcomes remains inconclusive. This study found that while PROM incidence was high across all four fever subgroups (27.7%–35.9%) and tended to increase with higher temperatures, the differences were not statistically significant. This suggests that inflammation and infection may not be directly correlated with temperature severity. Consequently, even modest temperature elevations during intrapartum fever warrant adequate attention, particularly in women with PROM. Additionally, no significant differences in labor induction rates or duration were observed across subgroups, suggesting that while labor induction may increase the risk of intrapartum fever, it does not necessarily increase fever severity. Apart from infec-

tion, factors such as prolonged induction leading to consumptive dehydration and increased oxygen consumption may also contribute to fever development, highlighting the need for individualized analysis and management strategies in clinical practice. Finally, no significant differences were found among subgroups in neonatal asphyxia, amniotic fluid contamination, or NICU admission rates, indicating that temperature severity does not directly correlate with neonatal outcomes. However, given the adverse impact of intrauterine infection on neonatal prognosis, infection should be excluded first when intrapartum fever occurs to guide further management decisions.

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Author Contributions: Liu Liheng conceived and designed the study, conducted the research, and drafted the manuscript. Liu Liheng, Mi Xue, and Hou Lei collected and organized data and performed statistical analysis. Hou Lei and Wang Xin revised the manuscript. Zou Liying was responsible for quality control, review, and overall supervision of the article.

Correspondence to: ZOU Liying, Chief Physician/Master Supervisor; Department of Obstetrics, Beijing Obstetrics and Gynecology Hospital, Capital Medical University, Beijing Maternal and Child Health Care Hospital, Beijing 100026, China; E-mail: zouliying@ccmu.edu.cn

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Note: Figure translations are in progress. See original paper for figures.