

Maternal Fever During Labor and Delivery

Maternal fever is an important clinical concern during labor with potential short- and long-term consequences for both the mother and the child. The Journal of Clinical Gynecology and Obstetrics (2022) defines maternal fever as either a single oral temperature of 39°C or more or two oral temperature readings between 38 and 39 recorded 30 minutes apart. In term and late preterm pregnancies, maternal fever can complicate up to one in ten deliveries (Cornet et al., 2025) and intrapartum fever has been reported to occur in approximately 1.6% to 14.6% of childbirths (Burgess et al, 2017).

Fever during childbirth arises from infectious diseases as well as non-infectious etiologies. Intraamniotic infection such as chorioamnionitis is an important infectious etiology of fever during labor (Zamstein, 2023). While the well-known cause of intrapartum fever is intraamniotic infection, there is mounting evidence that obstetric and labor-related factors, especially epidural analgesia, contribute to the development of fever during labor and delivery (Zhao et al.,2021). Non-infectious factors comprise epidural anesthesia for pain control, prostaglandin medications used to induce labor, dehydration, elevated environmental temperature, and the stimulation of inflammatory pathways that occur during childbirth (Burgess et al, 2017). Both histologic chorioamnionitis and epidural analgesia were found to be independent predictors of intrapartum fever by Curtin et al. (2015) in a retrospective cohort study, underscoring the possibility that both infectious and non-infectious inflammatory mechanisms may be at work during labor. A duration exceeding 6 hours between the onset of intrapartum fever and delivery has been associated with a greater likelihood of infectious etiology (Zubikarai et al., 2022). Regardless of whether it is caused by infectious or non-infectious etiologies, maternal fever carries negative consequences for both mother and child.

In their 2012 retrospective cohort study, Greenwell et al. examined 2,705 low-risk nulliparous women at term who were receiving epidural analgesia. They discovered that, regardless of a confirmed infection, there was a definite dose-response relationship between the maximum maternal intrapartum temperature and poor neonatal outcomes (Greenwell et al, 2012). In particular, higher rates of neonatal hypotonia, assisted ventilation, 1- and 5-minute Apgar scores below 7, and early-onset seizures were linked to maternal fevers exceeding 99.5°F (37.5°C) (Greenwell et al, 2012). The risks increased linearly with temperature. Multivariable-adjusted odds ratios revealed 2- to 6-fold increases in the following outcomes for mothers with severe fever above 101°F (38.3°C): early-onset seizures (aOR 4.6, 95% CI 1.5–14.3), hypotonia (aOR 2.0, 95% CI 1.2–3.2), assisted ventilation (aOR 3.5, 95% CI 1.6–7.8), 1-minute Apgar <7 (aOR 2.1, 95% CI 1.4–3.2), and 5-minute Apgar <7 (aOR 6.5, 95% CI 1.1–39.5) (Greenwell et al, 2012).

In a population-based cohort of 248,594 laboring mothers, Cornet et al. (2025) showed a dose-dependent association between neonatal hypoxic-ischemic encephalopathy (HIE) and intrapartum maternal fever. A nearly fourfold increased risk of HIE was linked to fever (RR=3.92; 95% CI [3.24–4.75]), and the risk increased gradually from mild temperature elevations (37.5–37.9°C; RR=1.70) to temperatures of 39°C and higher (RR=8.47). Similar to this, a longer fever duration was linked to a higher risk of HIE; the risk increased from 2.3/1000 when the fever started less than an hour before delivery to 10.5/1000 when the fever lasted for six or more hours (Cornet et al., 2025). These correlations persisted even after controlling the length of labor, indicating that the height and duration of maternal hyperthermia have independent effects on the fetus (Cornet et al., 2025).

In addition, Goetzl (2023) found that intrapartum fever is associated with an increased risk of all-cause early neonatal mortality at term (OR 1.7; 95% CI 1.2–2.45). Parity-stratified analysis revealed associations with infant death (OR 2.42; 95% CI 1.35–4.35) and asphyxia-related early neonatal death (OR 2.81; 95% CI 1.48–5.34).

In a longitudinal study of 356,356 births between 1991 and 2021, Zamstein et al. (2023) found that compared to unexposed offsprings, offsprings exposed to maternal fever during delivery faced a higher risk of hospitalization for infections until they turned 18. The infections included viral, fungal, and ear, nose, and throat infections. This risk remained significant even after adjusting for possible confounders (adjusted HR 1.21, 95% CI 1.04-1.41, $p=0.016$) (Zamstein et al., 2023). This suggests that having fever during delivery could make children vulnerable to lifelong infections (Zamstein et al., 2023).

Methods

The following study was a cross-sectional examination of southern New Jersey birth records from 2020 to 2024. The data for this analysis was extracted from the Vital Events Registration and Information (VERI) system which is managed by the New Jersey Department of Health's Office of Vital Statistics and Registry. The dataset included births recorded in southern New Jersey counties of Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, and Salem. Regardless of the mother's residential state, each birth observation was included if it took place in one of the above-mentioned southern counties of New Jersey.

The outcome variable for this study was the incidence of maternal fever. Variable "LD Fever" from the birth records was taken to be an indicator of maternal fever during labor. Exposure variables included individual characteristics of mother's race and ethnicity, nulliparity, intrapartum infection, Chorioamnionitis, Group B Streptococcus

and premature rupture of membrane and labor characteristics such as method of delivery, use of epidural, induction of labor, and prolonged labor. Statistical analysis was conducted using R studio 4.5.1. Birth records with missing information for the outcome variable of “LD Fever” were excluded. Specifically, records for which “LD Fever” variable was observed as “NULL” or blank were excluded from the final sample to ensure that birth records included in the final sample had complete information for the outcome variable of maternal fever. Furthermore, individual race and ethnicity categories were condensed into broader groups of non-Hispanic White, non-Hispanic Black, Hispanic, Asian and Other Races. This recategorization was done to align race and ethnicity categories with those used in the NJ Maternal Health Hospital report card by the New Jersey Department of Health (New Jersey Department of Health, n.d.).

Univariate analysis was conducted using Chi- Square test to assess the association between exposure variables and the outcome variable of incidence of maternal hemorrhage. Significant predictors ($p < 0.05$) included race and ethnicity, method of delivery, use of epidural, induction of labor, parity, premature rupture of membrane, chorioamnionitis, intrapartum infection and prolonged labor. Multilevel modelling was adopted for the analysis, as the births are nested within different birthing facilities. Firstly, a null model was run to estimate the proportion of variance in the incidence of maternal hemorrhage due to differences in facilities. The intraclass correlation coefficient was calculated to quantify the variation in the incidence of maternal hemorrhage on account of facility level clustering. Second, a multilevel logistic regression model was run with “LD Fever” as an outcome variable. The fixed effects in this model included variables of race and ethnicity, method of delivery, use of epidural, parity, Group B Streptococcus, Chorioamnionitis, intrapartum infection, premature rupture of membrane and the facility in which the birth took place was set as a random effect.

Results

The final sample consisted of 90,604 birth records. Birth records were categorized based on incidence of maternal fever during labor and delivery: those who suffered LD fever (Labour and Delivery Fever) (n = 1,125, 1.24%) and those who did not suffer LD fever (n = 89,479, 98.76%). A summary of sample demographic characteristics and other relevant clinical factors by incidence of LD fever can be found in Table 1.

Table 1. Characteristics of Sample by Outcome Variable: LD Fever (N=90,604)

Characteristic	LD Fever Yes n=1125 (1.24%)	LD Fever No n=89,479 (98.76%)	p-value
Race			<0.001
NH White	434 (38.58)	45,908 (51.31)	
NH Black	202 (17.96)	14,685 (16.41)	
Hispanic	391 (34.76)	23,157 (25.88)	
Asian	88 (7.82)	4,573 (5.11)	
Other Races	4 (0.36)	456 (0.51)	
Method of Delivery			<0.001
Vaginal/ Spontaneous	653 (58.04)	59,224 (66.19)	
Vaginal/Forceps	22 (1.96)	525 (0.59)	
Vaginal/Vaccum	59 (5.24)	1,697 (1.89)	
C-Section	387 (34.4)	27,848 (31.12)	
Induction			<0.001
Yes	533 (47.38)	25,758 (28.79)	
No	588 (52.27)	62,628 (69.99)	

Epidural			<0.001
Yes	994 (88.36)	58,731 (65.64)	
No	129 (11.47)	29,694 (33.19)	
Parity			<0.001
Nulliparous	504 (44.8)	19,243 (21.51)	
Multiparous	266 (23.64)	54,272 (60.65)	
Prolonged Labour			<0.001
Yes	73 (6.49)	837 (0.94)	
No	1,047 (93.07)	87,495 (97.78)	
Premature rupture of membrane			<0.001
Yes	136 (12.09)	3,147 (3.52)	
No	986 (87.64)	86,208 (96.34)	
Group B Streptococcus			0.1153
Yes	162 (14.4)	14,481 (16.18)	
No	963 (85.6)	74,995 (83.81)	
Chorioamnionitis			<0.001
Yes	497 (44.18)	428 (0.48)	
No	628 (55.82)	89,051 (99.52)	
Intrapartum Infection			<0.001
Yes	206 (18.31)	121 (0.14)	
No	919 (81.68)	89,358 (99.86)	

Maternal Fever occurred in 1.24% (n=1,125) of the study population (N=90,604). The incidence of maternal fever varied by race. Of the 1,125 cases of maternal fever, 38.58% were non-Hispanic White women, 34.76% were Hispanic women, 17.96% were non-Hispanic Black women, 7.82% were Asian women and 0.36% were women of other races. There was evidence a statistically significant relationship between race and maternal fever ($p < 0.001$).

Among women who developed maternal fever during labor and delivery (n=1125), 47.38% had labor induced, 88.36% received epidural, 44.8% were nulliparous, 6.49% experienced prolonged labor, 12.09% had a premature rupture of membranes, 14.4% were Group B Streptococcus positive, 44.18% had chorioamnionitis, 18.31% had intrapartum infection and 34.4% delivered via caesarean section.

All the obstetric and infectious exposures tested were significantly associated with maternal fever ($p < 0.001$), except Group B streptococcus, which showed no statistically significant association ($p = 0.1153$).

We fitted multilevel logistic regression models with maternal fever during labour and delivery as the binary outcome and patient level obstetric and infectious exposures as fixed effects with a random intercept for facility to account for clustering. In the empty multilevel model only facility level random intercept was included, which gave an intra class correlation coefficient of 0.26, indicated that approximately 26% of variance in maternal fever was attributable to differences between facilities.

Table 2. Adjusted Multivariable Logistic Regression Model of Risk Factors for Maternal Fever During Labor and Delivery

Characteristic	Odds Ratio	p-value
Race		

NH Black	1.43	0.004
Hispanic	2.03	<0.001
Asian	1.77	0.002
Other Races	1.26	0.744
Method of Delivery		
Vaginal/Forceps or vacuum	1.55	0.03
C-Section	1.16	0.114
Epidural		
Yes	2.7	<0.001
Parity		
Nulliparous	3.54	<0.001
Premature rupture of membrane		
Yes	2.93	<0.001
Group B Streptococcus		
Yes	0.83	0.149
Chorioamnionitis		
Yes	92.5	<0.001
Intrapartum Infection		
Yes	21.87	<0.001

Note. Reference categories: non-Hispanic White, Vaginal Spontaneous delivery, no epidural use, multiparous, no premature rupture of membrane, no group B streptococcus, no Chorioamnionitis, no intrapartum infection

After Adjusting for obstetric and delivery characteristics, the facility level variance decreased to 0.18, suggesting that these individual level factors explained part, but not all of the between facility level variability in maternal fever. In the adjusted model, chorioamnionitis was strongly associated with maternal fever (adjusted odds ratio [aOR]=92.5, $p<0.001$) as was intrapartum infection (aOR = 21.87, $p<0.001$). Nulliparity was associated with higher odds (aOR = 3.54, $p<0.001$) of maternal fever. Epidural use also increased the odds of experiencing maternal fever during labor and delivery (aOR = 2.7, $p<0.001$). Experiencing premature rupture of membrane was also associated with higher odds of maternal fever (aOR=2.93, $p<0.001$). Group B streptococcus was not significantly associated with maternal fever during labor and delivery (aOR = 0.83, $p=0.149$). Compared with non-Hispanic White women, non-Hispanic Black, Hispanic and Asian women had higher adjusted odds of maternal fever during labor and delivery. Hispanic women had higher odds of maternal fever (aOR = 2.03, $p<0.001$), followed by Asian women (aOR = 1.77, $p=0.002$) and non Hispanic Black women (aOR=1.43, $p=0.004$). Compared with spontaneous vaginal birth, vaginal birth assisted with forceps or vacuum was associated with higher odds of maternal fever (aOR=1.55, $p = 0.03$), whereas Caesarean section showed no significant association.

Table 3. Adjusted Odds ratios and p-values for Maternal Fever, Stratified by Race

Variable	Category	NH		Hispanic		Asian	
		Black OR	p-value	OR	p-value	OR	p-value
Method of Delivery							
	Vaginal/Forceps	0.29	0.365	2.23	0.274	2.5	0.227
	Vaginal/ Vaccum	0.74	0.688	1.25	0.603	2.06	0.259
	C-Section	1.21	0.353	1.18	0.296	1.16	0.681
Epidural							
	Yes	3.55	<0.001	1.8	0.002	8.01	0.003
Nulliparity							
	Nulliparous	2.67	<0.001	3.5	<0.001	3.05	0.0009
Premature rupture of membrane							
	Yes	2.78	0.0007	2.02	0.009	2.59	0.059
Group B Streptococcus							
	Yes	1	0.992	0.81	0.303	0.8	0.676
Chorioamnionitis							
	Yes	60.73	<0.001	96.08	<0.001	56.02	<0.001

Intrapartum

Infection

Yes	17.38	<0.001	36.32	<0.001	4.76	0.067
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Induction

Yes	1.13	0.568	1.68	0.0007	---	---
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Note. Reference categories: Vaginal Spontaneous delivery, no epidural use, multiparous, no premature rupture of membrane, no group B streptococcus, no Chorioamnionitis, no intrapartum infection, no induction of labour

We additionally fitted race stratified multivariable models to assess whether associations between obstetric factors and maternal fever differed across races. In all racial strata, use of epidural, nulliparity, and chorioamnionitis was found to be associated with higher odds of maternal fever during labor and delivery. Group B streptococcus was not statistically associated with maternal fever in any of the racial groups. Epidural use was associated with higher odds of maternal fever in all racial groups. The magnitude of association varied across groups, with highest point estimate observed among Asian women (aOR=8.01), followed by non-Hispanic Black women (aOR=3.55) and Hispanic women (aOR=1.8). Likewise, nulliparity was associated with higher odds of maternal fever in all racial groups. The magnitude of association varied across groups, with highest point estimate observed among Hispanic women (aOR=3.5), followed by Asian women (aOR= 3.05) and non-Hispanic Black women (aOR=2.67). Chorioamnionitis demonstrated strong associations with maternal fever in all groups, with large effect sizes consistent with clinical expectations. Induction of labour was associated with higher odds of maternal fever among Hispanic women (aOR=1.68, p=0.0007), but this association was not observed in other racial groups. Similarly, intrapartum infection and premature

rupture of membrane was associated with higher odds of maternal fever among Hispanic and non-Hispanic Black women, but this association was not observed among Asian women.

Table 4. Clinical and Labor Characteristics of Maternal Fever Cases by Race and Ethnicity

	NH White	NH Black	Hispanic	Asian	Total
Perinatal Fever Cases	434	202	391	88	1125
Induction	49.77%	45.54%	45.78%	46.59%	47.38%
Epidural	90.78%	88.61%	83.89%	95.45%	88.36%
Nulliparous	48.16%	43.07%	41.18%	45.45%	44.80%
Prolonged Labour	7.37%	6.93%	5.12%	6.82%	6.49%
Premature Rupture of Membrane	12.44%	11.88%	11.51%	12.50%	12.09%
Group B Streptococcus	12.44%	20.79%	14.32%	10.23%	14.40%
Chorioamnionitis	45.16%	41.09%	44.76%	42.05%	44.18%
Intrapartum Infection	19.35%	18.32%	17.90%	14.77%	18.31%
Mean Gestational Age	39.09	38.37	38.53	38.72	38.73
Prenatal care received	91.01%	87.13%	87.47%	94.32%	88.53%
Delivery trial	25.81%	31.19%	26.60%	27.27%	26.93%
Nulliparous, Term, Singleton, Vertex (NTSV)	45.62%	39.60%	36.57%	44.32%	40.89%

Note. Gestational age is expressed in weeks.

Out of the 1,125 women who developed maternal fever during labour and delivery, 434 were non-Hispanic White, 202 were non-Hispanic Black, 391 were Hispanic, and 88 were Asian. Overall, maternal fever was experienced in about 1.24% of deliveries, but Asian women saw the highest rate at 1.89%, followed by Hispanic women at 1.66%, non-Hispanic Black women at 1.36%, and non-Hispanic White women at 0.94%. Labor was induced in roughly half of all women across every racial group, ranging from 45.54% in non-Hispanic Black women to 49.77% in non-Hispanic White women. Use of epidural was common at 88.36% overall, with Asian women receiving it most frequently at 95.45% and Hispanic women the least at 83.89%. Nulliparity ranged from 41.18% among Hispanic women to 48.16% among non-Hispanic White women. Prolonged labor was documented in 6.49% of cases overall and was most prevalent among non-Hispanic White women at 7.37%. Premature rupture of membranes occurred in 12.09% of fever cases, with the highest proportion observed among Asian women at 12.50%. Group B streptococcus colonization was most prevalent among non-Hispanic Black women at 20.79%. Chorioamnionitis was identified in 44.18% of cases, with comparable rates across all racial groups. Intrapartum infection affected 18.31% of women overall and was marginally more prevalent among non-Hispanic White and non-Hispanic Black women relative to Hispanic and Asian women. Mean gestational age at delivery was 38.73 weeks overall, with non-Hispanic White women having the highest mean at 39.09 weeks. Prenatal care utilization stood at 88.53% across the cohort, reaching 94.32% among Asian women. Trial of labor was documented in 26.93% of cases. Nulliparous, term, singleton, vertex pregnancies accounted for 40.89% of the cohort overall, with the highest proportions among non-Hispanic White women at 45.62% and Asian women at 44.32%, compared to 36.57% among Hispanic and 39.60% among non-Hispanic Black women.

Table 5. Apgar Score Differences

	Average Apgar Score	Average Apgar
Maternal Fever	at 5 mins	Score at 1 mins
Yes	8.6	7.28
No	8.83	8.01

The impact of maternal fever during labor and delivery extended to neonatal outcomes. A difference was found in Apgar scores of infants born to mothers who experienced maternal fever and ones born to mothers who did not experience maternal fever. Mean Apgar scores at both 1 minute and 5 minutes were lower among infants born to women who experienced maternal fever compared to those born to women who did not experience maternal fever during labour and delivery. At 1 minute, the mean Apgar score was 7.28 in the fever group versus 8.01 in the no-fever group. At 5 minutes, the mean Apgar score was 8.6 in the fever group versus 8.83 in the no-fever group.

Discussion

In this study, which included 90,604 births, the occurrence of fever during labor was low, affecting 1.24% of the births (n=1,125). Maternal fever was not uniformly distributed across racial and ethnic groups. Among the cases of maternal fever during delivery, 38.6% were non-Hispanic Whites, 34.8% were Hispanics, 18.0% were non-Hispanic blacks, 7.8% were Asians, and 0.4% were of other races. This was statistically significant ($p < 0.001$).

Infection-related factors, especially chorioamnionitis and intrapartum infection, had the strongest association to maternal fever. Epidural use, nulliparity, and premature rupture of membrane also independently increased the odds of fever, even after accounting for clustering at

the facility level. Together, these findings indicate that maternal fever during labor is driven mainly by infectious and obstetric factors, rather than simply reflecting differences in care practices across hospitals. When analyses were stratified by race, epidural use, nulliparity, and chorioamnionitis increased fever risk across all racial groups. Notably, the effect of epidural use was especially pronounced among Asian women, and the effect of nulliparity was particularly strong among Hispanic women. Induction of labor was associated with higher odds of fever among Hispanic women but not other racial groups. Intrapartum infection and premature rupture of membranes were associated with fever among Hispanic women and non-Hispanic Black women but not Asian women in our stratified models. These differences in the magnitude of the effects could be attributed to differences in the clinical setting, labor management practices, or patient risk profiles rather than biological differences between racial groups consistent with guidance from the American College of Obstetricians and Gynecologists (2024) that structural and care-related factors contribute to the health disparities experienced in obstetrics.

Chorioamnionitis showed the strongest association with maternal fever in the adjusted model, which aligns with clinical expectations. As a condition representing intra-amniotic infection, it is typically diagnosed during labor using intrapartum fever alongside other maternal or fetal indicators of inflammation (Kachikis et al., 2019, Jung et al., 2023). The large magnitude of association observed likely reflects both the underlying biological relationship between infection and fever and the fact that maternal fever is a key clinical criterion used in the diagnosis of chorioamnionitis during labor (Jung et al., 2023). The strong association observed with intrapartum infection further highlights the role that infectious and inflammatory processes play in the development of maternal fever during labor (Kachikis et al., 2019, Jung et al., 2023).

Intrapartum fever has been linked to adverse neonatal outcomes particularly among nulliparous mothers, who often have longer labor and more interventions, which may increase exposure to inflammatory and infectious processes (Petrova, 2001). Similarly, nulliparity was associated with higher odds of maternal fever. Firsttime mothers often experience longer and more complex labor courses, with greater exposure to obstetric interventions and inflammatory or infectious processes that may contribute to intrapartum fever.

Newborns of mothers with maternal fever had lower mean Apgar scores at 1 minute and 5 minutes compared to newborns of mothers without maternal fever. Although these differences were small, these results imply that maternal fever may impact newborn adaptation and that newborns of mothers with maternal fever should be closely monitored, mirroring previous studies showing that intrapartum maternal fever may impact newborn well-being (Ling & Wan, 2025).

A number of limitations should be acknowledged. Firstly, no causal relationships can be established as this was an observational study based on administrative birth records. Second, clinically important information, which might affect maternal fever, was not considered in this study, such as the duration of labor, the number of vaginal examinations, and the administration of antibiotics. Finally, the stratified analyses by racial group should be interpreted with some caution, as smaller sample sizes within certain groups may have reduced the reliability of those estimates.

In conclusion, maternal fever during labor and delivery was found in 1.24% of births and was strongly associated with infection-related conditions, epidural use, nulliparity, and premature rupture of the membranes. The findings of this study emphasize the role of infection-related and obstetric factors in the etiology of fever during labor and delivery and the need for continued monitoring and management of infection risk during labor and delivery.

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