

# Maternal Factors Associated with Late Preterm Births

Sanjay Singh<sup>1</sup>, Atul Seth<sup>1</sup>, Madhusudan Dey<sup>1</sup>, D Maji<sup>2</sup>

## ABSTRACT

**Introduction:** The neonatal morbidity and mortality though have gradually come down in recent past, the preterm deliveries especially the prevalence of late preterm births have unfortunately gone up. Late preterm deliveries are associated with increased neonatal complication rate compared to term deliveries. This study makes an endeavour to find out the relevant maternal factors associated with late preterm births. This also looks into the fetomaternal outcome e.g. indication and route of delivery, Apgar score of the new born baby and their neonatal intensive care unit (NICU) admissions

**Material and Methods:** This was a retrospective observational study conducted at a tertiary care centre from Mar 2013 to Feb 2015. In this study 236 late preterm delivery cases were analysed. The controls were 819 early term (37 -38 weeks) delivery cases of the same time frame.

**Results:** History of prior abortion, fetal death and preterm birth is not associated with increased incidence of late preterm birth. Maternal morbidities like hypertensive disorders of pregnancy (21.1%) and preterm premature rupture of membrane (13.5%) were significantly associated with late preterm births. Emergency caesarean section (24.6%) rate was significantly higher in late preterm birth group compared to early term deliveries. There was no difference in Apgar score in both the groups but late preterm births had more NICU admissions compared to early term deliveries.

**Conclusions:** Hypertensive disorders of pregnancy and preterm premature rupture of membrane were associated with increased incidences of late preterm birth and almost one fifth late preterm deliveries required NICU care.

**Keywords:** Late preterm birth, Hypertensive disorder of pregnancy, NICU, preterm premature rupture of membrane, Apgar score

## INTRODUCTION

As per available data 75% of all preterm births in 2009<sup>1</sup> were constituted by late preterm infants i.e. those delivered between 34 -36 6/7 weeks gestation. This makes them the most rapidly increasing subgroup of neonates (25% increases in the last ten years). For an obstetrician, most important priority is delivery of babies who are physiologically mature and are capable of successful transition to the extra uterine environment. It is also important to avoid iatrogenic complications of prematurity and maternal complications from delivery. It is generally accepted that births should occur at a minimum of 39 weeks gestation unless earlier delivery occurs spontaneously or because of maternal or fetal medical indications. There is a bit of ambiguity in recommendation for upper limit of duration of pregnancy for steroid induction for fetal lung maturity. Many institutions and protocols in fact do not recommend steroid induction beyond 34 weeks period of gestation and we follow the same. Neonatal morbidity however is increased in late preterm birth when compared with term deliveries.<sup>2</sup> Comparing term infants,

infants born at 34 0/7 to 36 6/7 weeks gestation experience more feeding difficulties (32% versus 7%), hypoglycemia (16% versus 5%), jaundice (54% versus 38%), temperature instability (10% versus 0%), apnea (6% versus < 0.1%), and respiratory distress (29% versus 4%).<sup>3</sup> Late preterm infants also receive intravenous fluids (27% versus 5%), evaluations for sepsis (37% versus 13%), and mechanical ventilation (3.4% versus 0.9%) more often than their term counterparts. Thus in order to identify possible preventive measures a better knowledge of the risk factors is essential. This study made an attempt to find out the risk factors for late preterm birth and look into the fetomaternal outcomes by gestational age among late preterm (34-36 6/7 weeks) and early term (37 - 38+0 weeks) deliveries at our institution.

## MATERIAL AND METHODS

This was a retrospective observational study. All the pregnant mothers reporting for delivery to our labour room from Mar 2013 to Feb 2015 were included in the study. The ethical clearance was obtained from our local ethical committee.

In this study 236 cases of late preterm deliveries defined as deliveries between 34 to 36 6/7 weeks period of gestation were included. These cases were compared with early term deliveries defined as deliveries between 37 to 38+ 0 weeks period of gestation. The period of gestation was correlated with ultrasonography (USG). In case of non reliability of stated last menstrual period the expected date of delivery suggested by first trimester USG was taken into account to calculate the period of gestation.

The data collection was done under following heads:

1. Sociological and demographic data
2. Maternal characteristics
3. Delivery indication
4. Mode of delivery
5. Apgar score at birth and neonatal intensive care unit (NICU) admissions

Whereas ACOG criteria<sup>3</sup> was taken into account to define gestational hypertension, the International Association of Diabetes and Pregnancy Study Groups Consensus Panel<sup>4</sup> (IADPSG) criteria was used to define gestational diabetes mellitus. Preterm premature rupture of membranes (PPROM) was defined as preterm rupture of membranes before onset of labour pains. In artificial reproductive techniques (ART) we included cases undergoing Intra-uterine insemination (IUI) or In vitro fertilisation (IVF) or Frozen embryo transfer (FET).

<sup>1</sup>Reader, <sup>2</sup>Resident, Department of Obst and Gynae, Armed Forces Medical College, Pune, Maharashtra, India

**Corresponding author:** Dr Madhusudan Dey, Department of Obst and Gynae, AFMC, Pune-411040, Maharashtra, India

**How to cite this article:** Sanjay Singh, Atul Seth, Madhusudan Dey, D Maji. Maternal factors associated with late preterm births. International Journal of Contemporary Medical Research 2016;3(9):2612-2616.

Anemia was defined as haemoglobin level less than 10 gm%. For socio-economic status, the mothers were divided in three groups based on the monthly income of the family- low (< Rs 15, 000), middle (Rs 15, 000-Rs30, 000), and high (>Rs 30, 000).

## STATISTICAL ANALYSIS

Statistical analysis was carried out by using EPI 2007. For this study, analysis of socio-demographic factors, obstetric risk factors and outcome of late preterm births were done by calculating Confidence Interval (CI), Odds ratio and P-value. The P-values of less than 0.05 was considered as statistically significant.

## RESULTS

4624 pregnant mothers delivered during the 2 years study period. Among them 452 (9.77%) delivered preterm (28 – 36 6/7 weeks) out of which 236 (5.10%) had late preterm delivery. Among the term deliveries 819 (19.63%) had early term deliveries (Figure-1).

Maternal characteristics in table-1 shows that most of the late preterm deliveries (48.3%) are in age group below 25 years. 44.5% primipara women delivered late preterm as compared to 33.6% primipara women who had early term deliveries. Both the groups had similar socioeconomic status. 12.7% women

belonging to late preterm delivery had history of previous fetal deaths.

Table-2 depicts the Obstetrics risk factors of late preterm deliveries. Comparing early term deliveries, hypertensive disorders of pregnancy that includes gestational hypertension, preeclampsia and preeclampsia superimposed on chronic hypertension were significantly high in cases of late preterm birth. We did not encounter any case of eclampsia in either group. Preterm premature rupture of membrane was seen in 13.5% late preterm births and it was found to be significant when compared with premature rupture of membrane in early

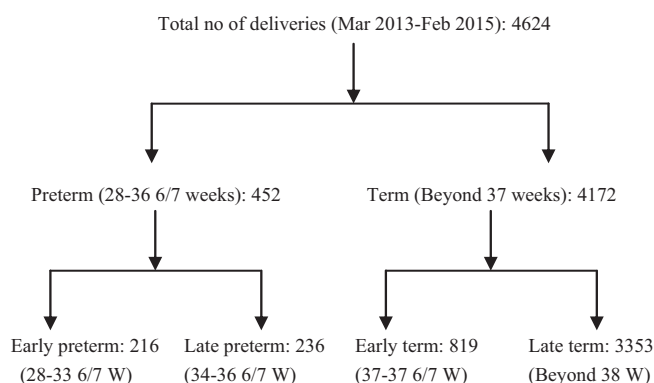


Figure-1: Methodology flowchart

Maternal age (Years)	Early term (n=819)	Late preterm (n=236)	OR	95% CI	P value
< 25	379 (46.3%)	114 (48.3%)	0.92	0.68 - 1.24	0.58
26-30	341 (41.6%)	98 (41.5%)	1	0.74 - 1.36	0.97
31-35	85 (10.4%)	19 (8.1%)	1.32	0.77 - 2.30	0.29
>35	14 (1.7%)	5 (2.1%)	0.80	0.27 - 2.58	0.67
Parity					
Primipara	275 (33.6%)	105 (44.5%)			
Multipara	544 (66.4%)	131 (55.5%)			
Socioeconomic status					
Low	205 (25%)	49 (20.8%)	1.27	0.88 - 1.84	0.17
Middle	604 (73.8%)	182 (77.1%)	0.83	0.58 - 1.19	0.29
High	10 (1.2%)	05 (2.1%)	0.57	0.57 - 1.94	0.30
H/o abortion					
0	541 (66.1%)	183 (77.5%)	0.56	0.40 - 0.80	0.008
1	221 (27%)	37 (15.7%)	1.99	1.33 - 2.97	0.003
2 or >	57 (6.9%)	16 (6.8%)	1.03	0.56 - 1.91	0.92
H/o fetal death in previous pregnancy					
Yes	78 (9.5%)	30 (12.7%)	0.72	0.45 - 1.16	0.15
No	741 (91.5%)	206 (87.3%)			

Table-1: Socio-demographic factors of late preterm birth

Obstetric factors (n=248)	Early term (n=819)	Late preterm (n=236)	OR	95% CI	P value
Hypertensive disorders of pregnancy	114 (13.9%)	50 (21.1%)	0.60	0.41 - 0.89	0.006
Anaemia (Hb < 10 gm%)	72 (8.7%)	21 (8.9%)	0.99	0.58 - 1.70	0.95
Gestational diabetes mellitus	47 (5.7%)	14 (5.9%)	0.97	0.50 - 1.87	0.91
Post caesarean pregnancy	48 (5.9%)	21 (8.9%)	0.64	0.36 - 1.13	0.09
PROM (PPROM in late preterm)	13 (1.6%)	32 (13.5%)	0.10	0.05 - 0.21	0.00
Multiple pregnancy (Twins)	18 (2.1%)	12 (5%)	0.42	0.19 - 0.99	0.01
Artificial reproductive techniques	41 (5%)	10 (4.2%)	1.19	0.56 - 2.58	0.62
Immunological factors	32 (3.9%)	9 (3.8%)	1.03	0.46 - 2.35	0.94
Previous preterm birth	84 (10.2%)	22 (9%)	1.11	0.67 - 1.82	0.76
Uterine anomalies	19 (2.3%)	6 (2.5%)	0.91	0.34 - 2.58	0.84

Table-2: Obstetrics factors for late preterm birth

term deliveries. Anaemia, gestational diabetes, post caesarean pregnancy, multiple pregnancy were the other associated factors in late preterm births but they were not found to be significant when compared with early term deliveries.

Obstetric outcome has been given in table-3 which shows that late preterm group had about 34% deliveries because of induction done mainly for maternal complications like severe preeclampsia, PPRM. About 40% of patients underwent caesarean section in late preterm births and among them 24.6% had emergency caesarean delivery as compared to 9.5% emergency caesarean delivery in early term births. 20 % of the new born babies required NICU admissions in the group comprising of late preterm births. Out of these, at 5 mins, 3% babies had Apgar score less than or equal to 7.

## DISCUSSION

In the past, majority of the work has been done for preterm deliveries less than 37 weeks of gestation. In our study, we have evaluated late preterm births only. This group may be at variance with the studies evaluating preterm deliveries as a whole. United States, United Kingdom, Scandinavian countries are reporting most of the data about late preterm births. From the developing world, precise figures about incidence of late preterm births and their final outcome are not available.<sup>4</sup> In the beginning of the present decade, the world wide incidence of preterm birth was about 11%. More than 80% of preterm births occurred between 32-37 weeks and maximum of preterm births were late preterm.<sup>5</sup> 9.97% women delivered preterm in this study and among them 52.21% had late preterm births. Extremes of reproductive age groups and economically disadvantaged sections of the society are at a higher risk of preterm labour. Carter et al corroborated the finding that extremes of reproductive age groups were at a higher risk of preterm labour.<sup>6</sup> In our study patients who were less than 25 years of age had maximum no of deliveries in both the groups and about 10% deliveries were in more than 30 years age group. Significant no (75%) of our patients were belong to middle socioeconomic status in early term as well as late preterm deliveries.

Very few workers have tried to evaluate the causative factors

of late preterm births. If addressed, this can help reduce the incidence of late preterm deliveries. However, it is still not completely understood. Aetiological factors are multiple and vary across region and countries.

As contrast to Melamed et al<sup>7</sup>, in our study, while evaluating the correlation of late preterm births with the parity of the patients, the association of late preterm births with parity was insignificant. Similar findings have also been reported by Mandruzzato and co-workers.<sup>8</sup> While evaluating the association of previous abortions with preterm births, Throp<sup>9</sup> found more risk of preterm birth in women who had earlier had induced abortions. In our study, there was previous history of abortions 22% women and out of these, 7 % had history of two or more abortions. History of abortions was similar in early term births. In the group comprising early term births, 27% patients had one abortion in the past where as 16% patients in the late preterm group had undergone one abortion earlier. The plausible explanation is that 41 women had medical abortion for unwanted pregnancy in the early term group. Previous history of one or more fetal loss was not significantly differing between two groups.

While evaluating causes of late preterm births, Reddy et al<sup>10</sup> attributed 14% of late preterm births to maternal medical conditions, 16% as a result of obstetric complications, 1% because of major congenital anomalies, 49% were spontaneous deliveries and about 23% had no documented indication. Laughon et al<sup>11</sup> reported that spontaneous labor, preterm premature rupture of membranes, and indicated deliveries each accounted for about 30% of late preterm births. 65% of our patients had spontaneous onset late preterm delivery and the balance 35% were induced, because of reasons such as preterm premature rupture of membranes and pre-eclampsia. Lubow et al<sup>12</sup> attributed 92% late preterm births to spontaneous onset or membranes rupture. The majority of late preterm births are either because of maternal complications or due to already existing medical problems in the mother.<sup>13</sup>

Coexisting chronic medical disorders in the mother like hypertensive disorders, diabetes and asthma have been found

Labour (n=248)	Early term (n=819)	Late preterm (n=236)	OR	95% CI	P value
Induced	264 (32.3%)	81 (34.3%)			
Spontaneous	555 (67.7%)	155 (65.7%)	1.10	0.80 – 1.51	0.54
Mode of delivery					
Normal	535 (65.3%)	139 (58.9%)	1.31	0.97 – 1.79	0.07
Elective caesarean	168 (20.5%)	36 (15.3%)	1.43	0.95 – 2.17	0.07
Emergency caesarean	78 (9.5%)	58 (24.6%)	0.32	0.22 – 0.48	0.00
Instrumental	38 (4.6%)	3 (1.3%)	3.78	1.11 – 15.48	0.01
Birth weight (Kg)					
< 1.5	4 (0.5%)	12 (5%)			
1.5-1.99	34 (4.2%)	63 (26.7%)			
2 – 2.5	246 (30%)	105 (44.5%)			
>2.5	535 (65.3%)	56 (23.7%)			
APGAR					
≤ 7	11 (1.3%)	7 (3%)	0.45	0.16 – 1.29	0.08
>7	808 (98.7%)	229 (97%)			
NICU admission					
Yes	29 (3.5%)	47 (20%)	0.15	0.09 – 0.25	0.00
No	790 (96.5%)	189 (80%)			

**Table-3:** Outcome of late preterm birth

to be associated with higher rates of induced and spontaneous deliveries before term. The risk of induction of preterm deliveries in these situations to the mother and foetus has to be judiciously compared against the risks associated with continuing the pregnancy.<sup>14</sup> In our study, hypertensive disorder of pregnancy was associated with 21% late preterm births, anaemia in the mother was found in 9% and preterm premature rupture of membrane was present in 13.5% cases. Other common associations in our study were gestational diabetes mellitus (6%) and assisted reproductive techniques (4%). 10 different factors which were associated with late preterm births are listed in table-2. We have found that hypertensive disorder of pregnancy and PPRM (vs PROM) were significantly associated with late preterm births as compared to early term births.

In late preterm deliveries, the route of delivery differs from term pregnancies. In late preterm, large number of these cases are induced because of co-existing medical problems and hence the rate of caesareans is much higher.<sup>10,11</sup> As compared to term neonates, thus the late preterm neonates have a worse short term outcome.<sup>15</sup> In our study, 40% patients underwent caesarean section in late preterm group compared to 30% patients had caesarean section in early term group. Among the caesarean sections, 25% patient had emergency caesarean in late preterm group which was significantly higher than early term deliveries as shown in table-3. Among all the cases of caesarean section 9% patients underwent repeat caesarean and 5 patients had successful trial of labour after caesarean section in late preterm births.

As per the available literature, fetal lung maturity is attained at 34 weeks period of gestation and hence this is used as milestone to assess potential complications to newborn.<sup>16</sup> Several workers have reported that complications like persistent pulmonary hypertension of new born, intraventricular hemorrhage (IVH), hypoglycemia, respiratory distress syndrome (RDS), dehydration, hyperbilirubinemia, sepsis and feeding problems occur more in late preterm babies as compared to term neonates.<sup>17-19</sup> In this study, 32% new born had weight less than 2 Kg and among them 5% newborn weighed less than 1.5 Kg. 3% new born had Apgar 7 or less and 20% new born required NICU admission for various neonatal problems in late preterm group. In our study, low birth weight was the cause of admission to NICU in 5 % babies and this was closely followed by respiratory difficulty which accounted for 4% babies being admitted to NICU. There were 3 foetal losses; all three of them were at approximately 34 weeks gestation. Out of these, one patient had severe pre-eclampsia and IUGR while the other two did not have any coexisting morbidity.

A large number of patients of late preterm deliveries were included in this study. Since the education level, socioeconomic background were similar in all our patients, the role of these as a confounding factor is ruled out. These two attributes provide strength to our study. Few important limitations must be considered when interpreting the results of our study. First, it was a retrospective study and we are not able to provide the details regarding various neonatal complications after admission to NICU. One of the limiting factors of our work is that it was not multicentric.

## CONCLUSION

Late preterm deliveries are an important group associated with substantial morbidity. Currently, the lack of data about this important group of patients in the developing world has been a reason for lack of development of management guidelines for these patients. Our result was in agreement with available studies regarding incidence of late preterm birth, other socio-demographic factors. There was a significant association of hypertensive disorders and preterm premature rupture of membranes with late preterm births and 20 % of these neonates had to be admitted for intensive care in the NICU.

## Declaration

Abstract was presented at FMF world congress 2015 at Crete, Greece.

## REFERENCES

1. Shaw RR. Late preterm birth: a new nursing issue. *MCN Am J Matern Child Nurs.* 2008;33:287-293.
2. Mally PV, Hendricks-Munoz KD, Bailey S. Incidence and etiology of late preterm admissions to the neonatal intensive care unit and its associated respiratory morbidities when compared to term infants. *Am J Perinatol.* 2013;30:425-431.
3. Wang ML, Dorer DJ, Fleming M, et al. Clinical outcomes of near-term infants. *Pediatrics.* 2004;114:372-6.
4. Beck S, Wojdyla D, Say L et al. The worldwide incidence of late preterm birth: a systemic review of maternal mortality and morbidity. *Bull world health organ.* 2010;88:31-8.
5. Blencowe H, Cousens S, Oestergaard MZ et al. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systemic analysis and implications. *Lancet.* 2012;379:2162-72.
6. Carter MF, Fowler S, Holden A, Xenakis E, Dudley D. The late preterm birth rate and its association with comorbidities in a population-based study. *Am J Perinatol.* 2011;28:703-707.
7. Melamed N, Klinger G, Tenenbaum-Gavish K, Herscovici T, Linder N, et al. Short-term neonatal outcome in low-risk, spontaneous, singleton, late preterm deliveries. *Obstet Gynecol.* 2009;114:253-260.
8. Mandruzzato GP, Cali G, Chiaffarino F, Pozzo GD, Danti L, et al. Risk Factors for Late Preterm Births: A Case-Control Study. *Gynecol Obstet.* 2013;3:182.
9. Thorp JM, Hartmann KE, Shadigian E. Long-term physical and psychological health consequences of induced abortion: Review of the evidence. *ObstetGynecolSurv.* 2003;58:67-79.
10. Reddy UM, Ko CW, Raju TN, Willinger M. Delivery indications late-preterm gestations and infant mortality rates in the United States. *Pediatrics.* 2009;124:234-240.
11. Laughon SK, Reddy UM, Sun L, Zhang J. Precursors for late preterm birth in singleton gestations. *ObstetGynecol.* 2010;116:1047-1055.
12. Lubow JM, How HY, Habli M, Maxwell R, Sibai BM. Indications for delivery and short-term neonatal outcomes in late preterm as compared with term births. *Am J Obstet Gynecol.* 2009;200:e30-3.
13. Villar J, Abalos E, Carroli G, et al. Heterogeneity of perinatal outcomes in the preterm delivery syndrome. *Obstet Gynecol.* 2004;104:78-87.
14. Institute of Medicine, Committee on Understanding

- Premature Birth and Assuring Healthy Outcomes, Board on Health Sciences Policy, Behrman RE, Butler AS, eds. Preterm Birth: Causes, Consequences, and Prevention. Washington, DC: National Academies Press; 2007.
15. Ma X, Huang C, Lou S, Lv Q, Su W, Tan J et al. The clinical outcomes of late preterm infants: a multi-center survey of Zhejiang. *J Perinat Med*. 2009 Jul 10.
  16. Raju TN, Higgins RD, Stark AR, Leveno KJ. Optimizing care and outcome for late-preterm (near-term) infants: a summary of the workshop sponsored by the National Institute of Child Health and Human Development. *Pediatrics*. 2006;118:1207–1214.
  17. Hunt CE. Ontogeny of autonomic regulation in late preterm infants born at 34-37 weeks postmenstrual age. *SeminPerinatol*. 2006;30:73-76.
  18. McIntire DD, Leveno KJ. Neonatal mortality and morbidity rates in late preterm births compared with births at term. *ObstetGynecol*. 2008;111:35-41.
  19. Verklan MT. So, he's a little premature. what's the big deal? *Crit Care NursClin North Am*. 2009;21:149-161.

**Source of Support:** Nil; **Conflict of Interest:** None

**Submitted:** 09-07-2016; **Published online:** 29-08-2016