



TIMING OF BIRTH AND OUTCOMES IN LOW RISK PREGNANCIES

Obstetrics & Gynaecology

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ABSTRACT

Background: The timing of delivery—whether during the day or night—has been hypothesized to influence maternal and neonatal outcomes due to variations in staffing levels, fatigue, and healthcare resource availability. However, evidence remains inconsistent across populations. This study aimed to assess the association between time of delivery (day vs. night) and selected maternal and neonatal outcomes in a tertiary care setting.

Objectives: To evaluate differences in demographic, obstetric, and neonatal parameters between daytime and nighttime deliveries. **Methods:** A cross-sectional analytical study was conducted on 200 obstetric cases (100 day deliveries and 100 night deliveries). Variables analyzed included age, education level, obstetric score, previous cesarean section, prenatal visits, induction of labor, type of delivery, birth weight, Apgar scores, and neonatal outcomes. Data were processed using SPSS (version 25), and chi-square tests were applied to determine associations between time of delivery and categorical variables, with significance set at $p < 0.05$.

Results: The mean maternal age distribution did not differ significantly between groups ($p = 0.190$). A significant association was observed between: Education level and time of delivery ($p = 0.004$), Previous cesarean section and time of delivery ($p = 0.036$), Type of delivery and time of delivery ($p < 0.001$), and Newborn admission to NICU and time of delivery ($p < 0.001$). Other variables, including obstetric score, prenatal visits, induction status, Apgar scores, and birth weight, showed no significant differences ($p > 0.05$). The majority of women delivered vaginally (72%), and 44.5% were primigravidae. Neonatal birth weights were predominantly between 2.5–3.0 kg (58%), with no statistically significant difference by delivery time ($p = 0.263$). **Conclusions:** While most maternal and neonatal parameters were comparable between day and night deliveries, significant differences were observed in education level, prior cesarean history, mode of delivery, and neonatal admissions, indicating potential disparities in risk factors and care dynamics between delivery timings. These findings highlight the need for continuous, high-quality intrapartum care across all shifts to optimize outcomes.

KEYWORDS

Daytime delivery, Nighttime delivery, Cesarean section, Neonatal outcomes, Birth weight, Obstetric score, Maternal factors, Apgar score, Chi-square analysis, Hospital delivery timing

INTRODUCTION

Childbirth is a critical event influenced by multiple maternal, fetal, and healthcare-related factors. The quality of obstetric and neonatal care provided during labor and delivery plays a crucial role in determining maternal and neonatal outcomes. Among the factors that may affect these outcomes, the timing of delivery has attracted considerable attention in recent years. Deliveries occurring during nighttime hours may be associated with reduced staffing levels, healthcare provider fatigue, limited immediate access to senior specialists, and decreased availability of hospital resources compared to daytime deliveries^{1,2}.

Several studies have attempted to evaluate whether the time of delivery influences obstetric interventions and neonatal outcomes. While some reports have suggested higher rates of adverse neonatal outcomes, operative deliveries, and neonatal intensive care admissions during nighttime deliveries, other studies have found no significant differences between day and night deliveries. These inconsistencies may be attributed to variations in healthcare infrastructure, patient populations, staffing patterns, and institutional protocols across different settings³⁻⁶.

In developing countries, where healthcare systems often face resource constraints and uneven staffing patterns, understanding the impact of delivery timing becomes particularly important. Identifying any association between the timing of delivery and maternal or neonatal outcomes may help improve hospital staffing policies, resource allocation, and quality of perinatal care. Therefore, the present study was undertaken to assess the association between daytime and nighttime deliveries and selected demographic, obstetric, and neonatal parameters in a tertiary care hospital setting.

METHODOLOGY

This hospital-based cross-sectional analytical study was conducted in the Department of Obstetrics and Gynecology at a tertiary care teaching hospital to evaluate the association between time of delivery

and maternal and neonatal outcomes. The study included a total of 200 obstetric cases, comprising 100 daytime deliveries and 100 nighttime deliveries.

Women who delivered in the study hospital during the study period were included in the study. Singleton pregnancies with both vaginal and cesarean deliveries were considered eligible. Cases with multiple pregnancies, intrauterine fetal demise, congenital fetal anomalies, and incomplete medical records were excluded from the study.

Ethical clearance for the study was obtained from the Institutional Ethics Committee prior to data collection. Confidentiality and anonymity of patient information were maintained throughout the study. Data were collected from patient case records and labor room registers using a structured proforma. Information regarding maternal demographic characteristics, obstetric history, delivery details, and neonatal outcomes was recorded. The variables analyzed included maternal age, educational status, obstetric score, previous cesarean section, number of prenatal visits, induction of labor, mode of delivery, birth weight, Apgar scores at 1 and 5 minutes, and neonatal admission status. For analytical purposes, deliveries were categorized into daytime and nighttime deliveries according to the institutional working-hour classification. Data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 25.0. Categorical variables were expressed as frequencies and percentages. The chi-square test was applied to determine associations between time of delivery and categorical variables. A p -value of less than 0.05 was considered statistically significant.

RESULTS

A total of 200 deliveries were included in the study, with 100 daytime deliveries and 100 nighttime deliveries. Demographic, obstetric, and neonatal characteristics were compared between the two groups.

Demographic Characteristics

The majority of mothers belonged to the age groups 23–25 years and

26–31 years in both daytime and nighttime deliveries. Although a higher proportion of nighttime deliveries occurred among women aged 23–25 years (34.0%) and daytime deliveries among women aged 29–31 years (30.0%), the association between maternal age and time of delivery was not statistically significant ($p = 0.190$). Educational status showed a statistically significant association with time of delivery ($p = 0.004$). Degree holders constituted the largest proportion in both groups (49.0%). Mothers with PUC education were more commonly represented in daytime deliveries (19.0%), whereas mothers with 12th standard education were more frequently observed in nighttime deliveries (13.0%).

Obstetric Characteristics

No significant association was observed between obstetric score and time of delivery ($p = 0.280$). Primigravida mothers constituted the largest group overall (44.5%), followed by gravida 2 mothers (36.5%). A statistically significant association was found between previous cesarean section history and time of delivery ($p = 0.036$). Most mothers had no previous cesarean section (92.5%); however, women with one previous cesarean section were more common in daytime deliveries (11.0%) compared to nighttime deliveries (2.0%). Prenatal visits did not differ significantly between the two groups ($p = 0.323$). The majority of mothers in both daytime and nighttime groups had attended six or more antenatal visits (91.0%). Similarly, induction of labor showed no statistically significant association with time of delivery ($p = 0.737$). Spontaneous labor accounted for the majority of deliveries in both daytime (78.0%) and nighttime (76.0%) groups.

Mode of Delivery

A highly significant association was observed between mode of delivery and time of delivery ($p < 0.001$). Vaginal deliveries were significantly more common during nighttime hours (86.0%) compared to daytime hours (58.0%). Conversely, cesarean sections were more frequently performed during daytime deliveries (42.0%) than nighttime deliveries (14.0%).

Neonatal Outcomes

Birth weight distribution did not differ significantly according to time of delivery ($p = 0.263$). Most newborns weighed between 2.5 and 3.3 kg in both groups. Apgar scores at both 1 minute and 5 minutes were comparable between daytime and nighttime deliveries, with no statistically significant differences observed ($p = 0.607$ and $p = 0.725$, respectively). More than 96% of neonates in both groups had Apgar scores ≥ 7 . Newborn admission rates demonstrated a highly significant association with time of delivery ($p < 0.001$). Neonatal admissions were substantially higher following nighttime deliveries (19.0%) compared to daytime deliveries (1.0%).

DISCUSSION

The present study evaluated the association between timing of delivery and various demographic, obstetric, and neonatal outcomes among women delivering in a tertiary care setting. Significant associations were observed with educational status, previous cesarean section history, mode of delivery, and neonatal admission rates, whereas maternal age, obstetric score, antenatal visits, induction of labor, birth weight, and Apgar scores did not differ significantly between daytime and nighttime deliveries.

Maternal Age and Educational Status

In the present study, maternal age distribution did not show a statistically significant association with time of delivery ($p = 0.190$). Nighttime deliveries were more common among women aged 23–25 years (34.0%), whereas daytime deliveries were more frequently observed among women aged 29–31 years (30.0%). Educational status demonstrated a statistically significant association with delivery timing ($p = 0.004$). Mothers educated up to PUC were more commonly represented during daytime deliveries (19.0%), whereas mothers educated up to 12th standard were more frequently observed during nighttime deliveries (13.0%).

These findings are partially consistent with the study conducted by Yee LM et al., who reported that women delivering at night were significantly younger and were more likely to be nulliparous and have government-assisted or no insurance coverage. Similarly, Brookfield KF et al. observed that women younger than 20 years were more likely to deliver during overnight (16.4%) and evening hours (16.5%) compared to daytime deliveries (13.4%) ($p = 0.03$). Virk MK et al. also demonstrated that maternal age influenced maternal outcomes, with women aged below 24 years having lower risk of adverse maternal

outcomes (aRR 0.86; 95% CI: 0.81–0.91), while women older than 35 years had increased risk (aRR 1.13; 95% CI: 1.06–1.21). In contrast, Brookfield KF et al. found no significant association between educational status and timing of delivery ($p = 0.72$), whereas our study demonstrated a significant association, possibly reflecting sociocultural and healthcare utilization differences within the study population.

Obstetric Score and Previous Cesarean Section

In our study, obstetric score did not significantly differ between daytime and nighttime deliveries ($p = 0.280$), with primigravida women constituting the majority in both daytime (40.0%) and nighttime deliveries (49.0%). However, previous cesarean section history showed a statistically significant association with delivery timing ($p = 0.036$). Women with one previous cesarean section were more commonly observed during daytime deliveries (11.0%) compared to nighttime deliveries (2.0%).

Comparable findings were reported by Yee LM et al., who observed that women with previous cesarean deliveries were more frequently represented during daytime deliveries, while nulliparous women were more likely to deliver at night. Schwartz A et al. similarly reported that women with one previous cesarean delivery were more frequently observed during evening deliveries (4.2%) compared to morning (3.9%) and nighttime deliveries (3.3%). Brookfield KF et al. further demonstrated that prelabor cesarean deliveries were predominantly daytime procedures (14.1%), whereas vaginal deliveries were more frequent overnight (83.4%) ($p < 0.001$). Vidal CRPM et al., however, did not identify a significant association between previous cesarean section history and delivery timing. The higher proportion of women with previous cesarean sections during daytime deliveries in our study may be attributable to the scheduling of elective or planned repeat cesarean procedures during routine daytime working hours.

Antenatal Visits and Induction of Labor

The present study found no statistically significant difference in antenatal visits ($p = 0.323$) or induction of labor ($p = 0.737$) between daytime and nighttime deliveries. The majority of mothers in both groups had attended six or more prenatal visits (91.0%), and spontaneous labor was the predominant mode of labor onset in both daytime (78.0%) and nighttime deliveries (76.0%).

These findings are in agreement with Vidal CRPM et al., who reported that 64.5% of women had attended at least six prenatal consultations without any significant variation according to delivery timing. In contrast, Yee LM et al. reported higher frequencies of induction and augmentation of labor among nighttime deliveries, while Schwartz A et al. observed that spontaneous labor was most common during morning deliveries (80.8%) and least common during evening deliveries (75.2%) ($p < 0.01$). Brookfield KF et al. also noted that cesarean delivery following labor or induction was more common during evening (14.3%) and overnight deliveries (14.9%) compared to daytime deliveries (11%). These differences may reflect variations in institutional labor management practices and obstetric protocols.

Mode of Delivery

Mode of delivery demonstrated a highly significant association with delivery timing in the present study ($p < 0.001$). Vaginal deliveries were significantly more common during nighttime hours (86.0%), whereas cesarean sections were more frequently performed during daytime hours (42.0%).

This observation is consistent with several previous studies. Yee LM et al. reported significantly higher rates of vaginal deliveries during nighttime hours and more frequent cesarean deliveries during daytime hours. Similarly, Brookfield KF et al. found that vaginal deliveries were highest during overnight hours (83.4%), while prelabor cesarean deliveries were predominantly performed during daytime hours (14.1%) ($p < 0.001$). Schwartz A et al. also observed that emergency cesarean deliveries were lowest during nighttime deliveries (9.2%) compared to evening deliveries (13%) ($p < 0.01$). Virk MK et al. reported that spontaneous vaginal delivery accounted for 75.3% of all deliveries, while emergency cesarean deliveries occurred less frequently during weekends (uRR 0.91; 95% CI: 0.87–0.96). The predominance of cesarean sections during daytime hours in our study may be explained by the routine scheduling of elective cesarean procedures and greater availability of operating room personnel and senior obstetricians during daytime shifts.

Birth Weight and Apgar Scores

In the present study, birth weight distribution did not significantly differ according to delivery timing ($p = 0.263$). Most neonates weighed between 2.5 and 3.3 kg in both groups. Similarly, Apgar scores at both 1 minute and 5 minutes were comparable between daytime and nighttime deliveries ($p = 0.607$ and $p = 0.725$, respectively), with more than 96% of neonates in both groups having Apgar scores ≥ 7 .

These findings are comparable to those reported by Schwartz A et al., who observed no significant differences in birth weight distribution or adverse neonatal outcomes across different delivery periods. Brookfield KF et al. also demonstrated comparable rates of severe neonatal morbidity and low 5-minute APGAR scores between daytime, evening, and overnight deliveries. Similarly, Vidal CRPM et al. found no significant differences in APGAR scores, oxygen requirement, neonatal resuscitation, or jaundice between daytime and evening/nighttime deliveries. Virk MK et al. reported median APGAR scores of 9 at 1 minute and 10 at 5 minutes, while neonates with APGAR scores below 7 had substantially increased neonatal mortality risk (aRR 68; 95% CI: 37–126). Overall, these findings suggest that immediate neonatal condition at birth may not be significantly influenced by the timing of delivery.

Neonatal Admission

A major finding of the present study was the significantly higher neonatal admission rate during nighttime deliveries (19.0%) compared to daytime deliveries (1.0%) ($p < 0.001$).

Similar findings were reported by Schwartz A et al., who demonstrated that prolonged neonatal hospitalization was more frequent during evening (3.6%) and nighttime deliveries (3.7%) compared to morning deliveries (3.1%) ($p < 0.01$). Multivariable analysis in their study further showed increased odds of prolonged neonatal hospitalization during evening (aOR 1.19; 95% CI: 1.07–1.33) and nighttime deliveries (aOR 1.17; 95% CI: 1.05–1.31). Vidal CRPM et al. also observed higher neonatal infection rates (PR 2.11) and neonatal ICU admissions (PR 2.99) during evening and nighttime deliveries. However, Brookfield KF et al. and Virk MK et al. did not observe a significant increase in neonatal morbidity or mortality according to delivery timing. The increased neonatal admissions observed during nighttime deliveries in our study may be related to reduced staffing levels, delayed specialist availability, increased clinical caution during nighttime hours, or differences in neonatal monitoring practices.

CONCLUSION

The present study demonstrated that the timing of delivery was significantly associated with certain maternal and neonatal outcomes. Educational status, previous cesarean section history, mode of delivery, and neonatal admission rates showed significant differences between daytime and nighttime deliveries. Nighttime deliveries were associated with a higher proportion of vaginal births and increased neonatal admissions, whereas cesarean sections were more frequently performed during daytime hours. No significant association was observed between delivery timing and maternal age, obstetric score, antenatal visits, induction of labor, birth weight, or Apgar scores. Despite comparable immediate neonatal parameters such as birth weight and Apgar scores, the higher rate of neonatal admissions during nighttime deliveries highlights the need for consistent neonatal surveillance and quality obstetric care across all working shifts. Overall, the findings suggest that delivery timing may influence selected obstetric and neonatal outcomes, emphasizing the importance of adequate staffing, resource availability, and standardized clinical care during both daytime and nighttime hours.

Table 1. Demographic Characteristics of Study Participants According to Time of Delivery

Variable	Day N (%)	Night N (%)	Total N(%)	p-value
Age Group (years)	19–22	12 (12.0%)	21 (21.0%)	0.190
	23–25	25 (25.0%)	34 (34.0%)	
	26–28	26 (26.0%)	21 (21.0%)	
	29–31	30 (30.0%)	17 (17.0%)	
	32–35	7 (7.0%)	7 (7.0%)	
Educational Status	Nil	6 (6.0%)	3 (3.0%)	0.004
	<10 STD	6 (6.0%)	8 (8.0%)	
	12 STD	1 (1.0%)	13 (13.0%)	
	PUC	19 (19.0%)	6 (6.0%)	
	SSLC	17 (17.0%)	20 (20.0%)	
	Degree	49 (49.0%)	49 (49.0%)	
	Masters	2 (2.0%)	1 (1.0%)	

Table 2. Obstetric Characteristics According to Time of Delivery

Variable	Day N (%)	Night N (%)	Total N (%)	p-value
Obstetric Score	PRIMI	40 (40.0%)	49 (49.0%)	0.280
	G2	41 (41.0%)	32 (32.0%)	
	G3	15 (15.0%)	17 (17.0%)	
	G4	4 (4.0%)	3 (3.0%)	
Previous Cesarean Section	0	88 (88.0%)	97 (97.0%)	0.036
	1	11 (11.0%)	2 (2.0%)	
	≥ 2	1 (1.0%)	1 (1.0%)	
Prenatal Visits	<6	7 (7.0%)	11 (11.0%)	0.323
	≥ 6	93 (93.0%)	89 (89.0%)	
Type of Labor	Induced	22 (22.0%)	24 (24.0%)	0.737
	Spontaneous	78 (78.0%)	76 (76.0%)	
Mode of Delivery	Vaginal	58 (58.0%)	86 (86.0%)	<0.001
	C-section	42 (42.0%)	14 (14.0%)	

Table 3. Neonatal Outcomes According to Time of Delivery

Variable	Day N (%)	Night N (%)	Total N (%)	P-value
Birth Weight (kg)	2.5–2.7	37 (37.0%)	24 (24.0%)	0.263
	2.71–3.0	37 (37.0%)	18 (18.0%)	
	3.01–3.3	27 (27.0%)	12 (12.0%)	
	3.31–3.6	8 (8.0%)	7 (7.0%)	
	3.61–3.9	1 (1.0%)	3 (3.0%)	
Apgar Score	1 min (≥ 7)	97 (97.0%)	96 (96.0%)	0.607
	5 min (≥ 7)	98 (98.0%)	99 (99.0%)	0.725
Newborn Admission	Yes	1 (1.0%)	19 (19.0%)	<0.001
	No	99 (99.0%)	81 (81.0%)	

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