



WEEKEND EFFECT ON OBSTETRIC REFERRAL PATTERNS AND MATERNAL–PERINATAL OUTCOMES AT SKIMS MCH, BEMINA, SRINAGAR: A ONE-YEAR COMPARATIVE OBSERVATIONAL STUDY

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Abstract:

Background: The “weekend effect” refers to poorer clinical outcomes among patients admitted during weekends compared to weekdays. Multiple studies across various specialties have shown increased morbidity and mortality on weekends, potentially due to reduced staffing, limited diagnostic availability, and delays in treatment initiation. Obstetric patients are particularly vulnerable, as labour and delivery are time-sensitive and can occur at any time. Understanding whether a weekend effect exists in obstetric referrals is critical, especially in regions where referral systems play a central role in maternal healthcare.

Objective: To determine whether differences exist in obstetric referral patterns between weekdays and weekends, and to compare maternal and perinatal outcomes among referred patients based on the day of referral.

Methods: A one-year comparative observational study was conducted at SKIMS MCH, Bemina, Srinagar. All obstetric referrals from primary and secondary health facilities were included. Data were collected using a structured proforma. Arrival time, referral reason, treatment provided, maternal complications, and perinatal outcomes were recorded. Referrals were categorized as weekday (Monday–Friday) or weekend (Saturday–Sunday). Statistical analysis was performed using Chi-square and t-tests; p

Results: Of 1100 obstetric referrals, 78.1% occurred on weekdays and 21.9% on weekends. Non-medical reasons for referral (non-availability of doctors, NICU, or infrastructure) were significantly more common on weekends (73.0% vs. 65.1%; $p=0.018$). Maternal complications such as obstetric infection (adjusted OR ~1.4) and composite maternal adverse outcomes (adjusted OR ~1.3) were higher on weekends. Perinatal outcomes, including depressed Apgar score (adjusted OR ~1.5) and composite neonatal morbidity (adjusted OR ~1.4), were also worse among weekend referrals.

Conclusion: A weekend effect was observed in both referral patterns and maternal–perinatal outcomes. Timely identification, early intervention, continuous staffing, and strengthened referral systems—especially on weekends—are essential to improving maternal and neonatal outcomes.

Keywords: Weekend effect, obstetric referral, maternal outcomes, perinatal complications, tertiary care hospital, Kashmir

Introduction:

Most maternal deaths are preventable with timely access to high-quality obstetric care and an efficient referral system. A skilled birth attendant who can recognize complications, initiate appropriate management, and arrange timely referral plays a pivotal role in reducing maternal and perinatal morbidity and mortality. The referral system is therefore not merely a logistical chain but a critical component of safe motherhood. The World Health Organization (WHO) emphasizes that accurate screening, early identification of high-risk pregnancies, timely referral, reliable transportation, and availability of comprehensive emergency obstetric care are essential for improving outcomes. A well-functioning referral system has been described as the keystone of maternal health programs.

In India, obstetric care is delivered through a three-tier system: primary, secondary, and tertiary levels. Primary Health Centres (PHCs) provide basic obstetric services and normal deliveries. Community Health Centres (CHCs) and Sub-district Hospitals offer secondary-level care with some operative capability. District hospitals and medical college hospitals serve as tertiary centres providing comprehensive emergency obstetric care (CEmOC), blood bank facilities, surgical interventions, specialist availability, and neonatal intensive care. Women with high-risk pregnancies or intrapartum complications are referred from lower-level facilities to these tertiary centres. However, this referral pathway is vulnerable to delays at multiple stages.

The “three-delay” model is widely used to understand maternal mortality. The delays include:

1. Delay in deciding to seek care (due to lack of awareness or sociocultural barriers)
2. Delay in reaching the facility (due to transport or geographic constraints)
3. Delay in receiving adequate care (due to insufficient staffing, infrastructure, or resources)

An effective referral system aims to mitigate all three delays; however, gaps in implementation can lead to avoidable complications.

The “weekend effect” refers to poorer outcomes among patients admitted or treated during weekends compared to weekdays. Since the 1970s, researchers have reported increased morbidity and mortality associated with weekend admissions across various medical specialties. Several explanations have been proposed: (1) patients presenting on weekends may be more severely ill (case-mix bias); (2) staffing levels and senior physician availability are reduced on weekends; (3) diagnostic and operative services may be limited; and (4) delays in clinical decision-making may occur. While some authors argue the weekend effect may be confounded by patient severity, many studies report significant differences even after adjustment for severity of illness.

Obstetrics is uniquely vulnerable to the weekend effect because childbirth cannot be scheduled solely during daytime or weekdays. Labour and emergencies can occur at any hour, and delays of even minutes may be critical. Therefore, consistent staffing, infrastructure, and service availability throughout the week are crucial. In low- and middle income countries, including India, weekend variability in service availability is common. Limited availability of doctors, anaesthetists, blood bank services, NICU beds, operating theatre capacity, and support staff during weekends may influence referral patterns and lead to poorer outcomes.

SKIMS MCH, Bemina, Srinagar, functions as a tertiary referral centre receiving obstetric emergencies from primary and secondary facilities across the Kashmir Valley. Understanding whether differences exist in referral volume, timing, indication, and outcomes between weekdays and weekends in this setting is essential. Identifying system-level gaps will allow

targeted interventions to improve continuity of care and maternal safety.

Therefore, the present study aims to:

1. Determine whether differential referral patterns exist between weekdays and weekends for obstetric cases.
2. Analyse maternal and perinatal outcomes among weekend versus weekday referrals at a tertiary care hospital in Kashmir.

This study provides local evidence on the weekend effect in obstetric care and seeks to inform strategies to strengthen referral systems and service availability throughout the week.

Materials and Methods

Study design: This was a comparative observational study conducted over a period of one year. The primary objective was to evaluate referral patterns and compare maternal and perinatal outcomes between weekday and weekend obstetric referrals.

Study setting: The study was conducted at SKIMS MCH, Bemina, Srinagar, a tertiary-level referral centre that receives obstetric emergencies from various primary and secondary health facilities across the Kashmir Valley.

Study Period and Population: All obstetric referrals presenting to SKIMS MCH during a 12-month study period were screened. A total of 1100 obstetric referrals that fulfilled the eligibility criteria were included in the final analysis. $p < 0.05$.

Inclusion Criteria

- All obstetric referrals from sub-centres, Primary Health Centres (PHCs), Community Health Centres (CHCs), Sub-district hospitals, District hospitals
- Referred in antepartum, intrapartum, or immediate postpartum period

Exclusion Criteria

- Non-obstetric referrals (medical or surgical conditions unrelated to pregnancy or labor)
- Self-referrals or direct walk-in patients
- Records with incomplete essential data (e.g. gestational age, day of referral, outcome)

Definition of Groups

To compare outcomes:

- **Weekdays:** Monday to Friday
- **Weekends:** Saturday and Sunday
This classification reflects standard staffing and administrative patterns in government healthcare facilities.

Data Collection

A structured **proforma** was used to collect data from:

- Referral slips
- Labour room registers
- Admission records

- Patient case files
- NICU registers

The following information was documented:

- Maternal age, parity, residence
- Antenatal care status
- Obstetric history
- Type and level of referring facility
- Duration of stay at referring facility (as reported by patient or attendant)
- Day and time of referral
- Mode of transport
- Reason for referral (medical or non-medical)
- Management provided at referring facility
- Consistency between referral indication and final diagnosis
- Maternal condition on admission
- Mode of delivery (spontaneous vaginal, instrumental, LSCS)
- Maternal complications (infection, haemorrhage, ICU admission, prolonged stay)
- Perinatal outcomes (live birth, stillbirth, Apgar score, NICU admission, neonatal death, birth weight, gestational age)

Outcome Measures

Maternal Outcomes

- Obstetric infection
- Postpartum haemorrhage
- Severe perineal trauma □ ICU admission
- Prolonged hospital stay
- Composite maternal morbidity

Perinatal Outcomes

- Live birth or stillbirth
- Depressed Apgar score (<7 at 5 min)
- Birth weight
- NICU admission

- Neonatal mortality
- Composite infant outcome

Ethical Considerations

This study involved retrospective review of medical records, with no direct patient contact. Data confidentiality was maintained by anonymizing records. Institutional Ethics Committee approval was obtained prior to study initiation.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using **SPSS version 23**.

- Categorical variables: frequencies and percentages
- Continuous variables: mean $\pm$ standard deviation or median (IQR)
- **Chi-square test** for categorical comparisons
- **Independent t-test** for continuous variables
- **Adjusted odds ratios (aOR) with 95% confidence intervals (CI)** were calculated for key outcomes
- **p < 0.05** was considered statistically significant

RESULTS AND OBSERVATIONS

Table I. Demographic profile and general characteristics

Parameter	Number (n=1100)	Percentage (%)
Age (years)		
<20	120	10.9
20–25	410	37.3
26–30	360	32.7
>30	210	19.1
Parity		
Primigravida	605	55.0
Multigravida	495	45.0
Residence		
Rural	820	74.5
Urban	280	25.5
Prior Antenatal Check-up		

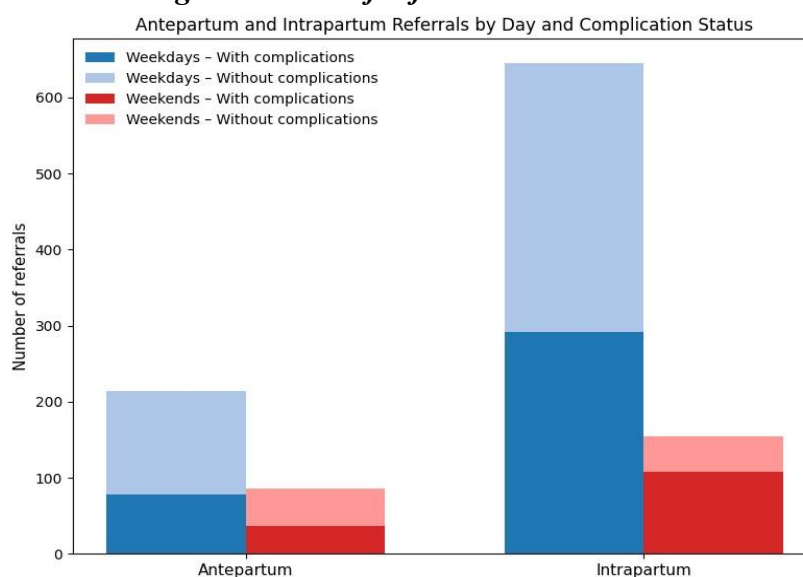
Yes	330	30.0
No	770	70.0
Type of referring facility		
District hospital	460	41.8
CHC	290	26.4
PHC	170	15.5
Sub-centre	70	6.4
Private hospital/clinic	110	10.0

The demographic characteristics are shown in Table I. The majority of referred women were between 20–30 years of age (70%), with a mean age of approximately 26.8 years. 55% were primigravida, and 74.5% resided in rural areas. Notably, 70% of women had no prior antenatal check-up, indicating poor ANC utilization. Most referrals originated from district hospitals (41.8%) and CHCs (26.4%), suggesting that higher-level secondary facilities contributed the largest referral volume.

Table II. Time of referral

Time of referral	Weekdays (n=859)	Weekends (n=241)	Total (n=1100)	pvalue
Antepartum				
With complications	78	36	114 (10.4)	0.021*
Without complications	136	50	186 (16.9)	
Intrapartum				
With complications	292	108	400 (36.4)	0.004*
Without complications	353	47	642 (58.3)	
Total	859	241	1100 (100)	

Figure 2. Time of referral distribution

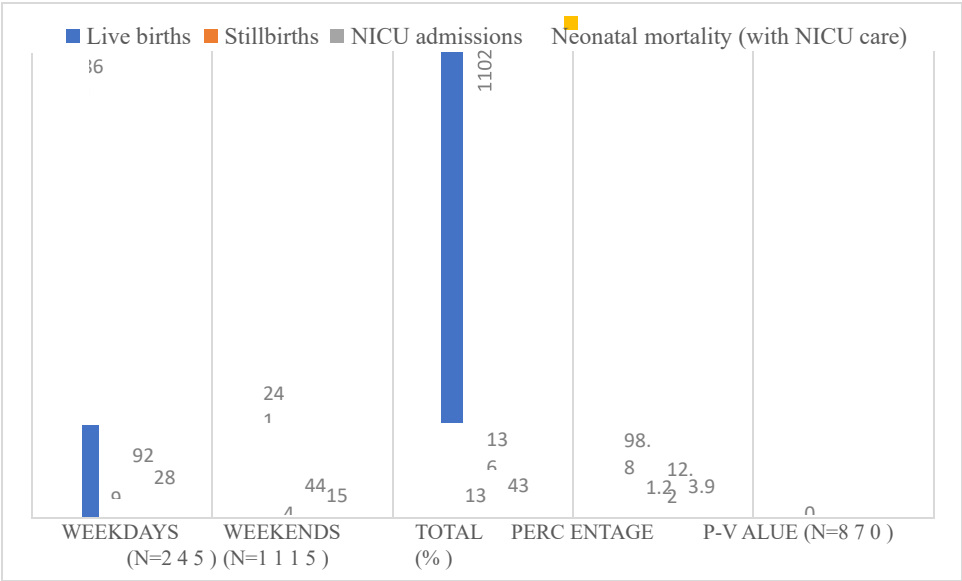


Intrapartum referrals constituted 72.7% of all cases, while antepartum referrals accounted for 27.3%. Complications were significantly more common in weekend referrals, both in the antepartum ($p=0.021$) and intrapartum periods ($p=0.004$). This suggests delayed recognition or limited management capacity on weekends.

Table III. Mode of delivery

Mode of Delivery	Weekdays (n=859)	Weekends (n=241)	Total (n=1100)	Percentage (%)	pvalue
Spontaneous vaginal delivery	245	95	340	30.9	0.118
Instrumental (Ventouse/Forceps)	70	18	88	8.0	
LSCS	544	128	672	61.1	
Total	859	241	1100	100	

Figure 3. Mode of delivery



Caesarean section (LSCS) was the most common mode of delivery (61.1%), followed by spontaneous vaginal delivery (30.9%). Instrumental deliveries accounted for only 8.0%. While LSCS rates were slightly higher on weekdays, the difference was not statistically significant ($p=0.118$).

Table IV. Fetal Outcome

Total births = 1115 (including multiple gestations)

Fetal outcome	Weekdays (n=870)	Weekends (n=245)	Total (n=1115)	Percentage (%)	p-value
Live births	861	241	1102	98.8	<0.001*
Stillbirths	9	4	13	1.2	
NICU admissions	92	44	136	12.2	
Neonatal mortality (with NICU care)	28	15	43	3.9	

Live births accounted for 98.8% of all deliveries, while stillbirths were 1.2%. NICU admissions (12.2%) and neonatal mortality (3.9%) were significantly higher among weekend referrals ($p<0.001$). These findings indicate a weekend effect on perinatal outcomes.

Table V. Distribution of referred cases and indications for referral

Indications for Referral	Weekdays n=859 (%)	Weekends n=241 (%)	p-value
Non-Medical Reasons	559 (65.1)	176 (73.0)	0.018*
Non-availability of NICU	210	68	0.012*
Non-availability of doctors	115	57	<0.001*

Lack of infrastructure (USG/NST/OT)	98	30	0.041*
Non-availability of blood bank	62	21	0.049*
No reason specified	74	20	0.088
Medical Reasons	300 (34.9)	65 (27.0)	0.018*
Eclampsia/PIH	95	22	0.034*
Postdatism	58	14	0.047*
IUFD/Abruption	42	10	0.381
Multiple pregnancy	30	8	0.229
Malpresentations	41	6	0.016*
Congenital malformations	34	5	0.028*
Ectopic pregnancy	25	4	0.064
Total	859 (100)	241 (100)	

Non-medical causes were the leading reason for referral, significantly more common on weekends (73.0% vs. 65.1%, $p=0.018$). Non-availability of NICU, doctors, and infrastructure were significantly higher on weekends. Among medical referrals, eclampsia/PIH, postdatism, malpresentations, and congenital malformations were also more frequent on weekends.

Time of Day Analysis

To examine diurnal patterns, the 24-hour period from 7 a.m. to 7 a.m. was divided into 3-hour intervals. Weekday referrals were evenly distributed, whereas weekend referrals clustered between **4 p.m. on Saturday and 1 a.m. on Sunday**, indicating potential delays in decision-making or resource limitations at peripheral centres during weekends.

Discussion:

This study examined referral patterns and compared maternal and perinatal outcomes between weekday and weekend obstetric referrals at a tertiary care hospital in Kashmir. The findings revealed a clear “weekend effect,” characterized by a lower volume of referrals on weekends but a disproportionately higher burden of complications and adverse outcomes among weekend arrivals. These observations highlight critical system-level vulnerabilities in referral processes, staffing models, and infrastructure availability during weekends.

In the present study, the mean maternal age was approximately 26 years, and the majority of referrals occurred in the 20–30-year age group, consistent with findings from Ambreen et al. and Kaye et al., who reported similar age distributions in referred obstetric populations (1,2). The predominance of primigravida women (55%) corresponded with earlier studies by Kaye et al.(2) suggesting that lack of previous pregnancy experience may contribute to delayed recognition of danger signs and increased referral rates. Furthermore, 74.5% of patients were from rural areas, reflecting persistent disparities in access to quality obstetric care in rural settings. Poor transportation networks, limited health-seeking behaviour, and inadequate peripheral services contribute to late presentation and increased referral dependency in rural populations.

A significant observation in this study was that 70% of women had no prior antenatal checkup. This proportion, although concerning, is consistent with other studies in South Asia, including Ambreen et al. (1) which highlight poor ANC coverage as a persistent challenge. Inadequate prenatal care leads to under-recognition of high-risk pregnancies and contributes to emergency referrals rather than planned transfers, thereby increasing maternal and perinatal risks. The predominance of referrals from district hospitals and CHCs in this study indicates that secondary-level facilities, despite having obstetricians, still refer many cases due to limitations in surgical capacity, blood banking, or neonatal care.

Intrapartum referrals accounted for 72.7% of cases, similar to earlier studies (10,12), underscoring the urgency of intrapartum complications and the need for rapid response systems. Both antepartum and intrapartum weekend referrals exhibited significantly higher rates of complications than weekday referrals, supporting the hypothesis that weekend patients are either more critically ill or referred later due to delays in recognition or transfer (15,16).

The mode of delivery distribution in this study showed caesarean section rates of 61.1%, consistent with Ambreen et al. (1) and Palmer et al. (13), reflecting high LSCS rates among referred patients due to advanced labour complications or fetal distress. LSCS was slightly more common on weekdays, but not statistically significant ($p=0.118$). High caesarean rates in referral populations suggest delayed transfers and poor management at peripheral centres.

Perinatal outcomes revealed a stillbirth rate of 1.2%, lower than older studies, likely reflecting improvements in neonatal care and referral systems. However, NICU admission rates (12.2%) and neonatal mortality (3.9%) were significantly higher on weekends consistent with the studies – Paupathy et al., Palmer et al., Gould et al. (12,13,14). The higher NICU admissions and adverse neonatal outcomes suggest compromised intrapartum care or delayed referral during weekends.

Maternal complications were also more frequent among weekend referrals. Adjusted odds of obstetric infection were ~ 1.4 times higher on weekends, aligning with Gould et al. (14) and Palmer et al. (13). Composite maternal complications, including haemorrhage, ICU admission, and prolonged hospital stay, were similarly elevated (~ 1.3 aOR), emphasizing sensitivity of maternal outcomes to staffing levels, response times, and multidisciplinary care access (16,20).

A striking pattern was the higher proportion of non-medical reasons for referral on weekends, including non-availability of doctors, lack of NICU facilities, and insufficient infrastructure (4,15). Clustering of weekend referrals during late evening and night suggests delays in referral decision-making or transport arrangements, reinforcing relevance of the “second” and “third delay” in the three-delay model (3,4).

The weekend effect is likely multifactorial: reduced staffing, lower specialist availability, slower diagnostic turnaround, and inadequate coordination between peripheral and tertiary centres. Although case-mix may play a role, the prevalence of system-related referral reasons on weekends indicates structural factors as major contributors (6,7,16). Inconsistencies between referral indications and final diagnoses (4) also suggest inadequate assessment or documentation at peripheral centres.

Policy implications include ensuring trained personnel, blood bank access, NICU availability, and operative services throughout the week (17,21). Standardized referral protocols, improved communication, structured feedback, telemedicine support, and transport optimization may reduce

delays and improve outcomes.

Conclusion:

This study demonstrates a clear weekend effect in obstetric referrals to a tertiary care centre in Kashmir. Weekend arrivals were more likely to involve complications and were often precipitated by non-medical factors such as non-availability of doctors, lack of NICU facilities, and inadequate infrastructure at peripheral health centres. Maternal complications, including obstetric infection and composite adverse outcomes, were significantly higher among weekend referrals. Perinatal outcomes, particularly NICU admissions, depressed Apgar scores, and neonatal mortality, were also worse on weekends.

Timely identification of complications, early initiation of treatment, and prompt referral are crucial. Strengthening the referral system, improving weekend staffing and infrastructure, and ensuring continuous availability of emergency obstetric and neonatal services are essential steps toward enhancing quality of care (17,21,22,23).

Limitations:

- Observational design: Retrospective nature limits causality inference.
- Reliance on medical records: Some variables based on patient/attendant recall.
- Single-centre study: Limits generalizability.
- Unmeasured confounding factors: Transport availability, decision-to-delivery interval, staffing at peripheral centres not directly measured.
- Rare outcomes: Low frequency of some neonatal complications may limit statistical power.

Despite these, the study provides important local evidence on the weekend effect in obstetric care.

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