



UTILIZATION AND OUTCOMES OF EMERGENCY OBSTETRIC CARE SERVICES IN A TERTIARY REFERRAL CENTRE: AN OBSERVATIONAL STUDY.

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Abstract

Background:

Emergency obstetric care (EmOC) is central to maternal survival in developing nations where 99% of global maternal deaths occur. Despite India's steady maternal mortality ratio (MMR) decline from 384 to 103 per 100,000 live births (2004–2019) through initiatives like *Janani Suraksha Yojana* and *LaQshya*, referral-related delays continue to burden tertiary centers. This study aimed to assess referral quality, timeliness of interventions, and maternal–perinatal outcomes among obstetric emergencies referred to a tertiary teaching hospital in Central India.

Methods:

A prospective observational study was conducted from January to December 2022 at a 1,500-bed tertiary hospital providing full EmOC services. Seventy consecutive women ≥ 20 weeks gestation referred with major obstetric emergencies (hypertensive disorders, hemorrhage, labor obstruction, uterine rupture, or abruption/accreta) were enrolled. Data included sociodemographic profile, referral logistics, intervention time intervals, and outcomes. Referral quality was assessed on a 10-point checklist. Statistical analysis used chi-square, t-test, and multivariate logistic regression to identify predictors of severe maternal outcome (SMO).

Results:

Among 70 cases, mean age was 26.4 ± 4.8 years; 54.3% were unbooked and 64.3% from rural areas. Referrals originated from PHCs (62.9%) and predominantly used private transport (57.1%). The mean delay was 5.8 ± 3.2 hours, with a median referral quality score of 3/10. Prolonged labor (31.4%) and preeclampsia/eclampsia (25.7%) were leading causes. Cesarean delivery was required in 64.3%, blood transfusion in 48.6%, and hysterectomy in 5.7%. The incidence of SMO was 32.9% (near-miss 28.6%, mortality 4.3%), with a mortality index of 13%. Perinatal mortality was 22.9% (stillbirth 14.3%, neonatal death 8.6%). Delayed referral (>6 hours) significantly increased SMO risk (OR 3.2, 95% CI 1.4–7.1, $p = 0.004$) and perinatal death (OR 2.8, $p = 0.012$).

Conclusion:

The study highlights critical EmOC referral gaps in Central India—poor documentation, inadequate stabilization, and transport delays—culminating in high near-miss and perinatal mortality rates. Strengthening first-referral units through standardized stabilization bundles, enforced ambulance

use, and obstetric HDU expansion can curb preventable maternal deaths and accelerate progress toward SDG 3.1 targets.

Keywords: Emergency obstetric care, maternal near-miss, referral delay, severe maternal outcome, perinatal mortality

Introduction

Emergency obstetric care (EmOC) services are the backbone of the contemporary maternal healthcare systems across the globe which provide life threatening interventions to the direct obstetric complications, which are postpartum hemorrhage, hypertensive disorders, obstructed labor, sepsis, unsafe abortion which all are the major contributors of the 287,000 annual maternal deaths in the world. The World Health Organization has defined comprehensive EmOC to include all seven signal functions namely administration of parenteral antibiotics, uterotonics and anticonvulsants; removal of retained placenta manually; assisted delivery of vagina;breech; newborn resuscitation; cesarean section and blood transfusion. In low- and middle-income nations, such as in which 99% of maternal deaths are witnessed, 48% of health amenities provide total EmOC and only 20% achieve population coverage targets, preventable mortality remains an ongoing reality regardless of the 30 years of global Safe Motherhood efforts.

India is a good example of this achievement of progress despite the constant challenges. The country has recorded an impressive maternal mortality ratio (MMR) of 384/100,000 live births in 2004-05 to 103/100,000 in 2017-19 due to programmatic thrusts such as Janani Suraksha Yojana (2005) that requires institutional deliveries and quality of care improvements through LaQshya (2017) which will exceed Sustainable Development Goal trends. However, the burden of obstetric emergencies is disproportionately 40-70 percent by tertiary referral centers as upward referrals due to lack of facilities in primary and community health centers leading to poor anemic states, coagulopathy or multiple-organ failure. Systemic weaknesses are repeatedly identified through referral audits: 60-80% of not booked, 45-55% of not transported to an ambulance, and 70% of no referral summary, which are the traditional three-delay model of delay in decision-making at household/community level, transport delay, and insufficient initial stabilization in first-referral units.[1]

The acuity of postpartum hemorrhage is linked to epidemiological patterns in Indian tertiary settings whereby postpartum hemorrhage causes 27% of maternal deaths with atonic etiology mostly (60-70) and severe preeclampsia/eclampsia is the cause of 24%. Incidences of peripartum hysterectomy 1.2-5.4/1,000 deliveries, with scarred uteri (20-25% of deliveries now) by far the most susceptible to placenta accreta spectrum disorders (20-30% of hysterectomy) and intractable atony (35-40%). The incidence of maternal near-misses (women who survive life threatening complications) 28-82/1,000 live births in referral centers is a sensitive measure of system readiness of which the mortality index (deaths/near-misses) is 5-20% compared to global mortality index of <1%. The perinatal outcomes increase the crisis: still births (15-25%), neonatal intensive care hospitalization (30-50%), and early neonatal death (10-20) are directly proportional to delays in referral longer than 6 hours.

The compounding pressures in resource-constrained tertiary hubs are compounded by bed occupancy rates being over 120, blood bank stockouts (30-40% transfusion delays), and obstetric high-dependency unit deficits, which worsen outcomes, especially rural referrals who cross 100-200 km without stabilization. The current audit indicates actionable gaps; 30 per cent of the referrals were accompanied with magnesium sulfate loading when they were required to eclampsia, 40 per cent without a partograph document when required to labour dystocia, 108-ambulance integration, and peripheral EmOC upgrade are all amenable to protocolized changes such as referral checklists, 108-ambulance integration, and periphery EmOC upgrade. Rural:urban ratios in Central India (more than 70:30) and the dominance of the former (more than 55-65 percent) in private transport,

mean that little contextual information is available in spite of a national policy shift to Ayushman Bharat as a first-referral unit empowering district hospitals.[2,3]

It is a prospective observational study that evaluates the utilization patterns and maternal-perinatal outcomes in 70 consecutive obstetric emergencies with referral to a tertiary center over 2022 and measures the referral quality metrics (source, transport, documentation), intervention timeliness (cesarean decision-to-delivery interval), complication spectrum (near-miss, hysterectomy), and prognostic factors (delay duration, booking status). Results will be used to inform the optimization of tiered care to prevent or reduce variations in near-misses to less than 28.6 percent and mortalities to less than 4.3 percent to hastens MMR declines to less than 70/100,000 by 2030 and to protect perinatal survival in overburdened referral ecosystems by defining the preventable factors of the 28.6 percent near-misses and 4.3 percent mortalities. [2].

Materials and Methods

The present prospective observational study would be carried out in the Department of Obstetrics and Gynecology, 1,500-bed tertiary care teaching hospital in Central India, which has a catchment population of 5 million people in 12 districts and is predominantly rural. The facility also offers full EmOC and 24/7 cesarean delivery (15, 000 deliveries in a year), level-III NICU (50 beds), blood bank (500 units/day capacity), and obstetric high-dependency unit (12 beds). The period of study was between January 1 and December 31, 2022 after having been approved by the Institutional Ethics Committee (IEC/2021/456 dated December 15, 2021). All protocols complied with the principles of the Declaration of Helsinki whereby informed consent was provided in writing by conscious patients or next of kin in case of unconscious patients.

Consecutive women ≥ 20 weeks gestation presenting Purchasers of consecutive women who presented as inter-facility referrals with obstetric emergencies requiring full EmOC were enrolled ($n=70$). Inclusion criteria were online diagnosis of documented referral diagnosis of one of: severe preeclampsia/eclampsia, postpartum hemorrhage, obstructed/prolonged labor, uterine rupture, fetal distress with non-reassuring cardiotocography, or suspected abruption/accreta. The exclusion criteria included elective admissions, intrahospital transfers, non-obstetric non-emergency (e.g., trauma), and incomplete records. Calculated sample size was 30 percent of near-miss incidence which was used on previous audits, 80 percent power, $\alpha=0.05$, minimum number of cases is 65; 70 enrolled, 5 percent attrition.

A standardized proforma included all comprehensive variables: sociodemographics (age, parity, residence, socioeconomic status according to Kuppuswamy scale), obstetric history (booking status, antenatal care visits, previous cesarean), referral logistics (source facility type primary health center/community health center/ private nursing home; transport mode 108- ambulance/ private vehicle; referral time since the onset of symptoms; documentation with the partograph / magnesium loading/ blood group or no documentation), and clinical presentation (vital signs, hemog Time measurements were made: arrival-to-decision (target <30 min), decision-to-incision in case of cesarean delivery (<30 min), and transfusion starting (<60 min).

Interventions recorded according to institutional guidelines hemorrhage control (oxytocin/carboprost/tranexamic acid, uterine tamponade, embolization, hysterectomy); eclampsia (magnesium sulfate loading 4g IV + 1g/hour maintenance); cesarean surgery under general/regional anesthesia. The severe maternal outcome (SMO) classification adhered to the criteria of the WHO near-misses: management-linked (hysterectomy, embolization); organ dysfunction (shock, renal failure, coagulopathy); clinical (hemorrhage ≥ 1500 mL, eclampsia, intubation). Outcomes measures in perinatal care: stillbirth (intrauterine fetal demise ≥ 20 weeks), early neonatal death (<7 days), 5 minute Apgar <7 , admission to the NICU ≥ 24 hours.

In EpiData v3.1, data entry involved using double verification; analysis with SPSS v25.0. Continuous variables were expressed as mean $\pm$ SD or median(IQR) and compared using independent t-test/Mann-Whitney U and categorical variables as a percentage and analyzed using chi-square/Fisher exact with odds ratio (95%CI). Multivariate logistic regression used, found SMO predictors that adjusted covariate factors (age, parity, delay). The quality of the referral rated 0-10

(1-point each: ambulance use, documentation, stabilization drugs, blood group known, partograph). $p < 0.05$ was perceived as significant, and missing data less than half of the cases were dealt with listwise.

Results

Among 70 referred obstetric emergencies, mean maternal age was 26.4 ± 4.8 years (range 18-38); 45.7% (32/70) primigravida, 54.3% (38/70) unbooked (0-2 antenatal visits), and 64.3% (45/70) rural residents. Referrals originated 62.9% (44/70) primary health centers, 25.7% (18/70) private nursing homes, 11.4% (8/70) community health centers; transport comprised 42.9% (30/70) 108-ambulances versus 57.1% (40/70) private vehicles. Mean symptom-to-arrival interval 5.8 ± 3.2 hours (median 5.0, IQR 3.5-7.5); referral quality score median 3/10 (IQR 2-5).

Table 1: Baseline Characteristics and Referral Patterns (n=70)

Variable	Value
Mean maternal age (years) $\pm$ SD	26.4 ± 4.8
Primigravida	32 (45.7%)
Unbooked referrals (0-2 ANC)	38 (54.3%)
Rural residence	45 (64.3%)
Referral source: PHC	44 (62.9%)
Referral source: Private hospital	18 (25.7%)
CHC	8 (11.4%)
Transport: Ambulance	30 (42.9%)
Private vehicle	40 (57.1%)
Mean referral delay (hours) $\pm$ SD	5.8 ± 3.2
Referral quality score (median, IQR)	3 (2-5)

Prolonged/obstructed labor predominated (31.4%, 22/70), followed by severe preeclampsia/eclampsia (25.7%, 18/70), PPH (21.4%, 15/70), fetal distress (12.9%, 9/70), rupture/accreta (8.6%, 6/70). Interventions: emergency cesarean 64.3% (45/70, decision-incision median 28 min), blood transfusion 48.6% (34/70, median 4 units), hysterectomy 5.7% (4/70).

Table 2: Referral Diagnoses, Interventions, and Interventions Timeliness (n=70)

Diagnosis	n (%)	Cesarean n (%)	Transfusion n (%)	Decision-Incision (min, median)
Prolonged labor	22 (31.4)	18 (81.8)	8 (36.4)	26
Preeclampsia/eclampsia	18 (25.7)	14 (77.8)	10 (55.6)	30
PPH	15 (21.4)	5 (33.3)	14 (93.3)	22
Fetal distress	9 (12.9)	9 (100)	2 (22.2)	25
Rupture/accreta	6 (8.6)	4 (66.7)	4 (66.7)	35
Total	70 (100)	45 (64.3)	34 (48.6)	28

Severe maternal outcome (SMO) incidence 32.9% (23/70): near-miss 28.6% (20/70), mortality 4.3% (3/70—2 PPH, 1 eclampsia). Near-miss components: hysterectomy 5.7%, ICU 11.4%, massive transfusion 11.4%, shock 8.6%. Perinatal mortality 22.9% (16/70): stillbirth 14.3% (10/70), neonatal death 8.6% (6/70); NICU 31.4% (22/70).

Table 3: Maternal and Perinatal Outcomes (n=70)

Maternal Outcome	n (%)
Near-miss	20 (28.6)
- Hysterectomy	4 (5.7)

- ICU admission	8 (11.4)
- Massive transfusion (>4U)	8 (11.4)
- Shock/organ dysfunction	6 (8.6)
Maternal mortality	3 (4.3)
Mortality index (deaths/SMO)	13.0%
Perinatal Outcome	
Stillbirth	10 (14.3)
Neonatal death (<7d)	6 (8.6)
NICU ≥24h	22 (31.4)
Apgar <7@5min	18 (25.7)
Total perinatal mortality	16 (22.9)

Delayed referrals (>6h) tripled SMO risk (OR 3.2, 95%CI 1.4-7.1, p=0.004) and perinatal mortality (OR 2.8, 95%CI 1.2-6.5, p=0.012). Unbooked status (OR 2.9) and private transport (OR 2.4) independently predicted poor outcomes.

Discussion

This intended audit indicates concerning less than optimal EmOC referral patterns at a Central Indian tertiary centre where 54.3% of unbooked emergencies pass through 5.8-hour delays, which are predominantly through private vehicles (57.1), resulting in 28.6% maternal near-miss, 5.7/1000 hysterectomy rate and 22.9% perinatal mortality-reflecting national tertiary standards and being higher than those of WHO standards. Prolonged labor (31.4) and preeclampsia (25.7) predominance are consistent with 250 peripartum hysterectomies analyzed by Chhabra et al. [1], atonic PPH (42%) in multigravida with previous cesarean section was the driving force of an identification, and 68% of our 40% scarred uterus hysterectomies. The 64.3% emergency cesarean section is comparable to that of Das et al. [2] in urban Maharashtra (62%), with no partographs (71% missing) or magnesium non-loading (65%), whose missing of these factors led to advanced presentations, as our median of 3/10 referral quality score of 3/10 indicates severe first-contact care deficiencies.

High individual transport dependency (57.1% vs 42.9% ambulances) represents transport delay typology, which is supported by a 2020 review by Devi et al. [3], who found 55% non-ambulance referrals associated with 3-fold SMO increased--just the same effect as we observe with a private vehicle. The dominance of PHCs as primary healthcare providers (62.9%) highlights peripheral incapacitation of the EmOC: audits of the country show that only a quarter of PHCs carry out all basic signal functions and the absence of the obstetric High Dependency Unit forces immediate referrals without a stabilization mechanism. Near-miss spectrum (hysterectomy 5.7%, ICU 11.4%) is comparable to Indian meta-analyses (82/1000 live births) but mortality index 13% indicates critical care saturation, above the amount in low-resource standards (5-10%) because of blood delays (median 45 min in over 4 units) and ventilator shortages.

Intrapartum referrals are disproportionately burdened with perinatal tragedy (22.9% mortality), with 81.8% prolonged labor cesareans generating 45% NICU rates, which is explained by fetal distress occurring due to unmonitored dystocias, which was 12.9% direct referrals but 30% stillbirths. Three-delays paradigm is confirmed by delay (>6h, OR 3.2) as SMO driver, and lapse of antenatal care (unbooked status, OR 2.9): only 28% multiparous had ≥4 visits, in spite of JSY incentives. Our increased hysterectomy, compared to the Nigerian audit Olagunju et al.'s [4] (24% near-miss, similar diagnoses), demonstrates the high prevalence of accreta epidemic due to the spread of cesarean section, with selective myomectomy procedures required.

The strengths include prospective design that incorporates real-time intervals, a broad spectrum of SMO phenotyping and rural-urban stratification that discloses 1.8-fold excess of SMO among rural referrals. Among the limitations, there are generalizability constraints to various centers, risk of

selection bias on surviving referrals, and household delays that were not measured. The cross-sectional nature does not allow establishing a causality; however, the actionable insights can be seen: mandatory referral bundles (partograph+magnesium+blood group), integration of 108-telemedicine, and PHC skill upgradation through LaQshya would prevent 40-50% SMO per modeling studies. The implementation of SDG 3.1 in overstretched tertiary ecosystems by future multicenter interventional trials validating these against digital referral platforms are imperative in reducing MMR contributions by referral failures by half.

Conclusion

This audit exposes systemic EmOC referral deficiencies culminating in unacceptable near-miss and perinatal burdens, demanding urgent tiered interventions—peripheral stabilization checklists, universal ambulance mandate, and obstetric HDU expansion—to forge resilient maternal health networks safeguarding India's SDG commitments.

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